Logistics Management Institute

Using Technology to Reduce Cost of Ownership
Volume 2: Business Case

LG404RD4

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Contents

Business Case Overview

BACKGROUND

The Assistant Deputy Under Secretary of Defense for Maintenance Policy, Programs, and Resources (ADUSD[L]/MPPR) tasked the Logistics Management Institute to assess the leverage available to reduce operations and support costs. The initial phase of the resulting study is documented in the annotated briefing in Volume 1 of this report. There, the major emphasis was on leverage available from technology insertion (in particular, the insertion of technology with improved reliability and maintainability). We found that a return on investment (ROI) of 9:1 in 20 years could be expected for technology insertion projects.

The final element in the study was to document a business case to assess the feasibility of a potential DoD-sponsored program to reduce the cost of ownership. The business case documented here in Volume 2, looked at available technology insertion opportunities and what leverage such a program could provide if initiated in the near future.

During field research for the study, we reviewed examples of technology insertion by the military services to determine "best practices." We found that they used different approaches to evaluate technology insertion opportunities and to determine ROI. A common method of computation was needed to support a business case.

Many businesses evaluate marginal investment opportunities by considering the profit earned over and above the initial investment and the timing of these profits. This is often computed as an internal rate of return (IRR) target that must be achieved by a marginal investment. The IRR typically accounts for the present value of those future profits.[1]

Due to the inherent differences between government savings and business profits, the internal rate of return (IRR) is less appropriate for the business case than a measure of savings generated by the investment. Thus, for the business case we chose ROI, which measures return (savings in operating costs) resulting from the investment. The time value of money is included by using the Office of Management and Budget (OMB) Circular A-94 discount rates[2] for future savings and investments.

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[1] John A. Tracy, John Wiley & Sons, *Fundamentals of Management Accounting.* Santa Barbara, Cal., Inc., 1976.

[2] The model uses the OMB discount rate from OMB Circular A-94, Revised Memorandum No. 64 to the heads of executive departments and establishments, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs.* Rates are updated annually in February. The current revision is OMB Memorandum M-95-03, 1995 *Discount Rates* for OMB Circular A-94, February 7, 1995. We used the rate without inflation, "*Discount Rates* for Cost-Effectiveness, Lease Purchase, and Related Analyses — Real Interest Rates on

Thus, we developed a spreadsheet model as a tool for reviewing potential military service projects to reduce the cost of ownership and for determining baseline expectations for the business case. The following discussion describes the model and applies it to examples of current potential projects to reduce cost of ownership. We used the results of these examples to make recommendations to the ADUSD(L)/MPPR on a potential cost of ownership reduction program.

ROI METHODOLOGY

The model defines ROI as Savings divided by Cost of Investment. More specifically:

◆ Savings = (Cost of operations with existing approach) - (Cost of operations with the cost-reducing technology implemented).

◆ Cost of investment = (Summation of costs of development [i.e., tailoring of technology to weapon system application], integration, testing, production, and fielding of upgraded weapon system). Sunk costs are not included.

This definition provides a taxpayer perspective on ROI when applied over the remaining life of the weapon system.

ROI is computed with and without field personnel costs, since any labor-hour reduction may not result in DoD personnel cost reductions. In many situations, labor hours freed-up on a specific weapon system are applied to other DoD labor requirements. Thus, it is important for the decision-maker to know the magnitude of the personnel component of savings when evaluating an investment. The model also provides results with and without OMB Circular A-94 discounting.

The ROI model is in the form of an Excel spreadsheet and has a sensitivity analysis capability. The model guides the user to input appropriate annual data over the remaining life cycle of the weapon system. With this data, the model computes the ROI and magnitude of investment and savings for the remaining weapon system life (up to 20 years). The spreadsheet consists of five sheets. The first contains assumptions and a summary of results. The next two sheets provide a format for inputting the existing and alternative programs, and the last two sheets compute ROI. A further discussion of the functions of these sheets is in Appendix A.

EVALUATION OF POTENTIAL SERVICE PROGRAMS

Potential projects to reduce cost of ownership were requested from the services through points of contact developed during the study. Due to the short time available to support the FY97 budget cycle, only unfunded projects that were

Treasury Notes and Bonds of Specified Maturities" (interpolated).

readily available were provided. A total of 57 projects were received from the three services. (These are not all the projects available, but they are typical of the projects seen during the study.) We selected nine of these for evaluation with the ROI model, based on time of arrival, data available, time available, and a qualitative review for the source of savings (our emphasis was on material savings). Many other projects appear to offer a good ROI.

Of the nine projects selected, eight offer excellent ROIs in the first 10 years. The description and ROI analyses for these projects, summarized here in Table 1-1, are included in Appendices B through J. In this summary the ROI and savings consider discounted material savings only (no field labor-hour savings) at the end of 10 and 20 years.

Table 1-1.
Summary of Business Case Projects (Material Savings only Discounted)

Project description	Investment ($ million)	10 year saving ($ million)	10 year ROI (# to 1)	20 year savings ($ million)	20 year ROI (# to 1)
Composite repairs of C/KC/RC-135 aircraft cracked and corroded structure	0.1	6.9	69	12.3	123
M-9 ACE — crew vent fan replacement	0.01	0.3	26	0.4	44
Integrated petroleum, oils, and lubricant data system	0.6	11	20	21.6	39
M1A1 tank — M256 120mm cannon tube and breech life extension	0.8	12.6	16	20.7	26
Solargizer vehicle battery maintenance system	5.8	81.8	14	140.6	24
A-10 aircraft — embedded GPS INU (EGI), versus AF baseline A-10 configuration with LN-39 inertial system and A-3 GPS receiver	8.9	105.7	16	235.2	35
MLRS fire control panel troop proficiency trainer (FCP-TPT)	3.2	36.4	11	0	10 year life
AH-64 helicopter — pressurize hydraulic reservoirs during aircraft startup and remove reservoir check valves	0.5	2.7	6	13.1	26
AH-64 helicopter — engine nose gearbox, change to cartridge-type oil pump	0.2	0.2	0	0.8	4
Total	20.1	257.6	13	444.7	22

Thus, for these nine projects, an investment of $20 million would produce savings of $258 million in 10 years for an overall ROI of 13:1. In 20 years the investment would have produced savings of $445 million, an ROI of 22:1.

CONCLUSIONS

First, the services can provide sufficient cost of ownership reduction projects to yield at least the ROI of 9:1 in 20 years suggested in Volume 1 of this study.

Second, the ROI model is a useable and effective tool for evaluating a wide variety of potential projects to reduce cost of ownership.

Description of Excel Spreadsheet Cost of Ownership Model[1]

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[1] Excel file ROI-MODL.XLS. Cells that require inputs are unlocked, while the overall sheets are protected/locked (no password used). With the exception of naming cells as discussed later in the report, there should be no need to unlock any sheet to input data. The protection prevents inadvertent entries in cells that should not be changed.

SHEET 1: ASSUMPTIONS AND SUMMARY RESULTS

The assumptions sheet provides a format to record general information and assumptions for the project. It also presents a summary of results from subsequent sheets. The title and data in red (discount rate and dollar notation) are automatically applied to subsequent sheets. As seen in the examples in the following appendices, space is provided for the user to insert the objective of the project and assumptions or data needed for evaluation.

For ease of building and reviewing formulas in the model, we suggest that data to be embedded in cell formulas be stated here and named (using Excel's *Insert — Name — Define* function) for subsequent use.[2] For example, named parameters in Appendix B include fleet size, estimate of percentage replacements, hours, rates, and material cost. The names are used extensively in formulas throughout the model (inserted into a formula with the Insert — Name — Paste function) to simplify formulas, reduce errors, and allow sensitivity analysis.

The lower portion of the sheet transfers data from the return on investment (ROI) sheets and presents it in summary form for ease of review. This summary, in conjunction with named parameters as suggested above, allows an easy sensitivity analysis by varying the value of any of the named parameters.

SHEET 2: EXISTING PROGRAM

The existing program sheet guides the user to formulate and enter the direct costs of related operations with the existing configuration. Nowhere in the model is it appropriate to include a prorated share of indirect costs such as base operations support, since they are not typically reduced by a weapon system change.

The first cost category is wholesale material cost, which the model sums from:

♦ *Depot-level repair cost (DLR).* This includes depot-level labor, depot-level consumables, transportation, etc. (i.e., fully loaded DLR cost). The DLRs are summed here from other user developed spreadsheets as shown in the example appendices.

♦ *Replenishment buy cost (Replen).* This category is intended to capture any material costs not included in DLRs (e.g., field consumables). Entries made in reparables and consumables are summed here and should include reparables and consumables directly or indirectly affected by the design change.

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[2] A sheet must be unlocked (*Tools — Protection — Unlock*) to name a cell. We suggest that the sheet remain locked except when naming a cell. Pasting a name does not require unlocking a sheet.

- *Depot-level maintenance cost.* This includes programmed depot maintenance and similar user-funded but centrally executed tasks not included in fully loaded DLR costs.

- *Military personnel cost (MILPERS).* This should include all direct field personnel labor costs.

The model computes the cumulative annual existing program costs with and without MILPERS and provides data to the subsequent sheets.

SHEET 3: ALTERNATIVE PROGRAM

The alternative program sheet first provides a form to record the *nonrecurring cost* of the investment. Not all of these categories are applicable to all projects. For example, the development costs to adapt the technology may have already been paid (sunk costs), and thus a zero would be entered across the development line.

The recurring cost category sums the cost of hardware for installation, *depot labor,* and any *field installation labor.* If the modification is contractor-installed or has contractor labor, these costs should be recorded in one of these lines and thus will be summed into recurring costs. All recurring costs should be included here.

The *cost to support the new program (sum of phasing in and phasing out designs)* does not require an input and is a locked field. It is computed from the data provided in the following two sections.

The next two sections establish the cost of the alternative program by providing a format to guide formulation of costs of phasing in the alternative program and phasing out the existing one. The cost categories are the same as the previous sheet. See the following appendices for examples. As seen in several of the examples, additional spreadsheets should be constructed as needed to support the data requirements.

SHEET 4: ROI MATERIAL ONLY

The ROI Material Only sheet is protected and no entries are required. From the material savings data on the preceding sheets, the discounted and undiscounted investment cost, saving, and ROI are computed. The results are presented by year and transferred to the Sheet 1 summary for the 10th and 20th years.

SHEET 5: ROI TOTAL SAVINGS

The ROI Total Savings sheet is protected and no entries are required. The discounted and undiscounted investment cost, savings, and ROI are computed from the total savings (material and personnel labor) data from the preceding sheets. Data for the 10th and 20th years are transferred to the summary on Sheet 1.

Composite Repairs of C/KC/RC-135 Aircraft Structure

◆ Cover chart

◆ Return on investment (ROI) analysis
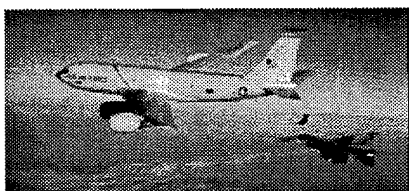
Composite Repairs of C/KC/RC-135 Aircraft Structure

Discounted Savings

$ M

10yr ROI 69:1
20yr ROI 123:1
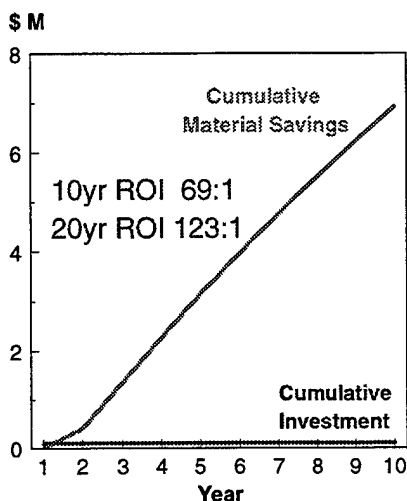
Annual Repair Cost Comparison

$ K
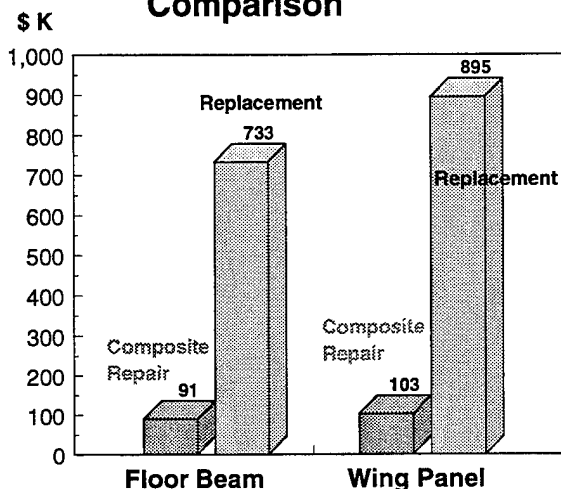
Data Source: AF Technology Transition Office & OC-ALC TIESM

Composite Repairs of C/KC/RC-135 Aircraft Structure

- **BACKGROUND:**
  - Floor beams of these aircraft are experiencing cracking due to stress corrosion and fatigue
  - Upper inboard wing skin panels are experiencing corrosion
  - These two problems are the aircraft life-limiting factors
- **OBJECTIVE:**
  - Validate and implement a composite material repair technique developed by E-Systems under IR&D
- **SOURCE OF SAVINGS:**
  - Reduce depot repair costs by eliminating the need for major aircraft disassembly to effect repair

Project Title: **Composite Repairs of Cracked and Corroded Aircraft Structures**
Source: AF Technology Transition Office and OC/ALC/TIESM

ASSUMPTIONS:

1) Objective: Use of composite material reinforcement/repair techniques to eliminate need for replacement of structure.
Two repairs are included in this analysis 1. Floor beams of the C/KC/RC-135 aircraft
2. Upper inboard wing skin panels of the C/KC/RC-135 aircraft
The cracked/corroded structure is cleaned and repaired in place eliminating the need for major
disassembly of the aircraft for replacement of entire piece of structure.

2) All costs are expressed in FY ___95___ dollars

3) Dollars expressed in ___$1,000___ s throughout spreadsheet

4) OMB CIR A-94 discount rate = ___4.8%___ for investments 3/95-2/96 with maturity of 10-20 years

5) Analysis based on the following data:
Fleet size ___621___ aircraft and are planned to remain in service until 2040
The AF estimates that ___30%___ will require beam and wing panel replacements during the remaining life
This results in ___4.2___ repairs per year for each.
This only includes beams and panels that are repairable. Costs below are for two beams or panels (2 each/aircraft).

BEAM REPLACEMENT requires	2,706	hours at	$58	per hour	Material cost is	$16,000
BEAM REPAIR requires	353	hours at	$58	per hour	Material cost is	$1,000
WING PANEL REPLACEMENT	2,972	hours at	$58	per hour	Material cost is	$38,900
WING PANEL REPAIR	387	hours at	$58	per hour	Material cost is	$2,000

6) Required investment is for tooling and training

7) Implementation of capability takes 16.6 months

RESULTS:

MATERIAL ONLY

1) ROI M at 10 years	88	to 1	For an investment of	$	100,000
			Cumulative saving of	$	8,815,179
2) ROI M at 20 years	193	to 1	For an investment of	$	100,000
			Cumulative saving of	$	19,302,684

DISCOUNTED, MATERIALS ONLY

3) ROI M d at 10 years	69	to 1	For discounted investment of	$	99,911
			Cumulative saving of	$	6,917,895
4) ROI M d at 20 years	123	to 1	For discounted investment of	$	99,911
			Cumulative saving of	$	12,262,333

TOTAL SAVINGS   No field level savings reported

5) ROI T at 10 years	88	to 1	For an investment of	$	100,000
			Cumulative saving of	$	8,815,179
6) ROI T at 20 years	193	to 1	For an investment of	$	100,000
			Cumulative saving of	$	19,302,684

DISCOUNTED TOTAL SAVINGS

7) ROI T d at 10 years	69	to 1	For discounted investment of	$	99,911
			Cumulative saving of	$	6,917,895
8) ROI T d at 20 years	123	to 1	For discounted investment of	$	99,911
			Cumulative saving of	$	12,262,333

Composite Repairs of Cracked and Corroded Aircraft Structures

Cost to support existing program	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
					$/ 1000					
Wholesale materiel cost	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
Cum w/o Milpers)	1,049	2,098	3,146	4,195	5,244	6,293	7,341	8,390	9,439	10,488
Cum (with Milpers)	1,049	2,098	3,146	4,195	5,244	6,293	7,341	8,390	9,439	10,488

	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Beam costs	68	68	68	68	68	68	68	68	68	68
Beam replacement labor	87	87	87	87	87	87	87	87	87	87
Wing panel costs	165	165	165	165	165	165	165	165	165	165
Wing panel replacement labor	730	730	730	730	730	730	730	730	730	730
Total DLR Cost	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to support existing program										
Wholesale materiel cost	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	·0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
Cum w/o Milpers)	11,536	12,585	13,634	14,683	15,731	16,780	17,829	18,878	19,926	20,975
Cum (with Milpers)	11,536	12,585	13,634	14,683	15,731	16,780	17,829	18,878	19,926	20,975
Beam costs	68	68	68	68	68	68	68	68	68	68
Beam replacement labor	87	87	87	87	87	87	87	87	87	87
Wing panel costs	165	165	165	165	165	165	165	165	165	165
Wing panel replacement labor	730	730	730	730	730	730	730	730	730	730
Total DLR Cost	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049

Composite Repairs of Cracked and Corroded Aircraft Structures

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to undertake new program										
Non-recurring cost	98	2	0	0	0	0	0	0	0	0
Development										
Integration										
H/W engineering										
S/W engineering										
Integration assets	93	0	0	0	0	0	0	0	0	0
Regression T&E										
Data& training	5	2	0	0	0	0				
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										
Cost to support new program										
(sum of phasing in & phasing out designs)										
Wholesale materiel cost	1,049	624	0	0	0	0	0	0	0	0
DLR cost	1,049	624	0	0	0	0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	1,049	624	0	0	0	0	0	0	0	0
Total annual (with Milpers)	1,049	624	0	0	0	0	0	0	0	0
Cum (without Milpers)	1,049	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672
Cum (with MilPers)	1,049	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672
Cost to support new design										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost	0									
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cost to support old (phasing out) design										
Wholesale materiel cost	1,049	624	0	0	0	0	0	0	0	0
DLR cost	1,049	624	0	0	0	0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

Composite Repairs of Cracked and Corroded Aircraft Structures

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Implementation costs	93									
Multizone temp. controller	72									
Positive pressure generator	21									
Training (data)	5	2								
NEW PROGRAM										
Beam costs		3	4	4	4	4	4	4	4	4
Beam repair labor		53	87	87	87	87	87	87	87	87
Wing panel costs		5	8	8	8	8	8	8	8	8
Wing panel repair labor		59	95	95	95	95	95	95	95	95
Total DLR costs		120	194	194	194	194	194	194	194	194
OLD PROGRAM										
Beam costs	68	26								
Beam replacement labor	87	255								
Wing panel costs	165	63								
Wing panel replacement lab	730	280								
Total DLR costs	1,049	624								

$/ 1000	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to undertake new program										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development										
Integration										
H/W engineering										
S/W engineering										
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E										
Data& training										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										
Cost to support new program										
(sum of phasing in & phasing out										
designs)										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	0	0	0	0	0	0	0	0	0	0
Total annual (with Milpers)	0	0	0	0	0	0	0	0	0	0
Cum (without Milpers)	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672
Cum (with MilPers)	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672	1,672
Cost to support new design										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost										
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cost to support old (phasing out)										
design										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

$/ 1000	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Implementation costs										
Multizone temp. controller										
Positive pressure generator										
Training (data)										
NEW PROGRAM										
Beam costs	4	4	4	4	4	4	4	4	4	4
Beam repair labor	87	87	87	87	87	87	87	87	87	87
Wing panel costs	8	8	8	8	8	8	8	8	8	8
Wing panel repair labor	95	95	95	95	95	95	95	95	95	95
Total DLR costs	194	194	194	194	194	194	194	194	194	194
OLD PROGRAM										
Beam costs										
Beam replacement labor										
Wing panel costs										
Wing panel replacement lab										
Total DLR costs										

ROI(M) Calculations — Composite Repairs of Cracked and Corroded Aircraft Structures

Material Savings YEAR	1	2	3	4	5	6	7	8	9	10
				$/ 1000						
Denominator (Cost to undertake new program)										
Non-recurring cost	98	2	0	0	0	0	0	0	0	0
Development	0	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	93	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data & training	5	2	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)	0	0	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Total Cost to Implement	98	2	0	0	0	0	0	0	0	0
Cum Cost to Implement	98	100	100	100	100	100	100	100	100	100
Discounted Cost to Implement	98	100	100	100	100	100	100	100	100	100
Numerator (Delta support cost resulting from new program)										
Cost to support existing program										
Wholesale materiel cost	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Cost to support new program										
Wholesale materiel cost	1,049	624	0	0	0	0	0	0	0	0
DLR cost	1,049	624	0	0	0	0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)										
Wholesale materiel cost	0	425	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost	0	425	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Total Delta	0	425	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Cumulative Delta	0	425	1,474	2,523	3,571	4,620	5,669	6,718	7,766	8,815
Discounted Cumulative Delta	0	406	1,360	2,271	3,139	3,968	4,758	5,512	6,232	6,918
Return on Investment										
ROI (Numerator/denominator)		4.3	14.7	25.2	35.7	46.2	56.7	67.2	77.7	88.2
DISCOUNTED ROI		4.1	13.6	22.7	31.4	39.7	47.6	55.2	62.4	69.2

ROI(M) Calculations

Composite Repairs of Cracked and Corroded Aircraft Structures

Material Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data & training		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Total Cost to Implement		0	0	0	0	0	0	0	0	0	0
Cum Cost to Implement		100	100	100	100	100	100	100	100	100	100
Discounted Cost to Implement		100	100	100	100	100	100	100	100	100	100
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		0	0	0	0	0	0	0	0	0	0
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)											
Wholesale materiel cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Total Delta		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Cumulative Delta		9,864	10,913	11,961	13,010	14,059	15,108	16,156	17,205	18,254	19,303
Discounted Cumulative Delta		7,573	8,197	8,793	9,361	9,903	10,421	10,914	11,385	11,834	12,262
Return on Investment											
ROI (Numerator/denominator)		98.6	109.1	119.6	130.1	140.6	151.1	161.6	172.1	182.5	193.0
DISCOUNTED ROI		75.8	82.0	88.0	93.7	99.1	104.3	109.2	114.0	118.4	122.7

ROI(T) Calculations

Composite Repairs of Cracked and Corroded Aircraft Structures

Total Savings	YEAR	1	2	3	4	5	6	7	8	9	10
						$/ 1000					
Denominator (Cost to undertake new program)											
Non-recurring cost		98	2	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		93	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		5	2	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Installation (field labor)		0	0	0	0	0	0	0	0	0	0
Total cost to implement		98	2	0	0	0	0	0	0	0	0
Cumulative total cost to implement		98	100	100	100	100	100	100	100	100	100
Discounted cumulative total cost		98	100	100	100	100	100	100	100	100	100
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		68	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		1,049	624	0	0	0	0	0	0	0	0
DLR cost		1,049	624	0	0	0	0	0	0	0	0
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Delta support cost											
Wholesale materiel cost		0	425	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost		0	425	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		68	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Total delta cost to support		0	425	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Cumulative total delta cost to support		0	425	1,474	2,523	3,571	4,620	5,669	6,718	7,766	8,815
Discounted cumulative delta cost		0	406	1,360	2,271	3,139	3,968	4,758	5,512	6,232	6,918
Return on Investment											
ROI (Numerator/denominator)		0.0	4.3	14.7	25.2	35.7	46.2	56.7	67.2	77.7	88.2
Discounted ROI		0.0	4.1	13.6	22.7	31.4	39.7	47.6	55.2	62.4	69.2

ROI(T) Calculations

Composite Repairs of Cracked and Corroded Aircraft Structures

Total Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Installation (field labor)		0	0	0	0	0	0	0	0	0	0
Total cost to implement		0	0	0	0	0	0	0	0	0	0
Cumulative total cost to implement		100	100	100	100	100	100	100	100	100	100
Discounted cumulative total cost		100	100	100	100	100	100	100	100	100	100
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		0	0	0	0	0	0	0	0	0	0
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Delta support cost											
Wholesale materiel cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
DLR cost		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Total delta cost to support		1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
Cumulative total delta cost to support		9,864	10,913	11,961	13,010	14,059	15,108	16,156	17,205	18,254	19,303
Discounted cumulative delta cost		7,573	8,197	8,793	9,361	9,903	10,421	10,914	11,385	11,834	12,262
Return on Investment											
ROI (Numerator/denominator)		98.6	109.1	119.6	130.1	140.6	151.1	161.6	172.1	182.5	193.0
Discounted ROI		75.8	82.0	88.0	93.7	99.1	104.3	109.2	114.0	118.4	122.7

M-9 ACE Crew Vent Fan

◆ Cover chart

◆ Return on investment (ROI) analysis
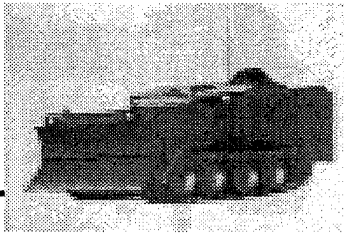
M9 ACE
Crew Vent Fan

Discounted Savings

$ M

- 10yr ROI 26:1
- 20yr ROI 44:1

Cumulative Material Savings

Cumulative Investment

0.3
0.25
0.2
0.15
0.1
0.05
0

1 2 3 4 5 6 7 8 9 10
Year

Reliability & Cost Comparison

Failures/yr.

$

Failure Rate
- New: 4.48
- Old: 22.4
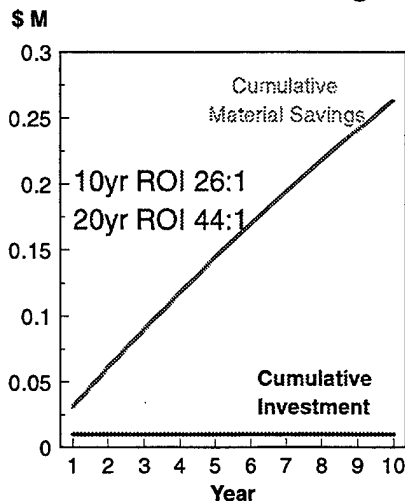
Unit Cost
- New: 310
- Old: 1,706
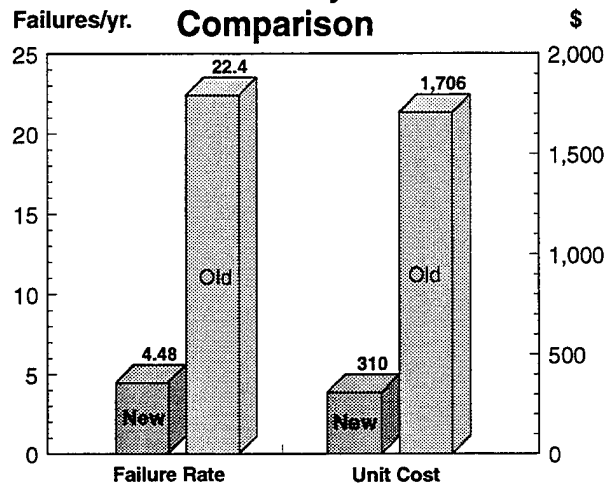
Data Source: TACOM Team OSCAR

M9 ACE Crew Vent Fan

- **BACKGROUND:**
  - The M9 is equipped with two vent fans that have demonstrated low reliability and high replacement unit cost
- **OBJECTIVE:**
  - Replace these fans with a single, higher reliability, and lower unit cost fan that is currently used on another Army vehicle
- **SOURCE OF SAVINGS:**
  - Reduced consumption of fans and lower unit cost

Project Title: **M9 ACE Crew Vent Fan**
Source: Army TACOM Team OSCR

ASSUMPTIONS:

1) Objective: Replace current   2   vent fans with one lower cost higher reliability fan
   now used on HMMWV
2) All costs are are expressed in FY95 dollars
3) Dollars expressed in $ 1 s throughout spreadsheets except on this page.
4) OMB CIR A-94 discount rate =   4.8%   for investments 3/95-2/96 with maturity of 10-20 years
5) Retrofit by attrition at the current fleet fan failure rate of   5% of vehicles per year
6) New fan has fleet failure rate of   1%   of vehicles per year
7) Number of vehicles in the fleet is   448
8) Maintenance time to replace 2 fans in the old configuration is the same as changing
   to the new configuration fan. Thus, the only Milpers savings is due to the lower failure
   rate on new fans.
9) Milpers cost of replacing failed fan=   1   hours at rate of $ 26   = $ 26
10 Cost of kit required to install the new fan is $ 200 plus 25% surcharge = $ 250
   Replacement cost of each old fan is $853
   Replacement cost of each new fan is $ 60
   No further development is required and modifications start in year 2 on attrition basis
   after 12 months to set up contracting vehicles.

RESULTS:

MATERIAL ONLY   *For an investment of* $ 10,000
   1) ROI at 10 years after initiation   **32**   to 1   with cum.savings of $ 323,246
   2) ROI at 20 years after initiation   **67**   to 1   with cum.savings of $ 668,829

DISCOUNTED MATERIAL ONLY   *For an investment of* $ 10,000
   ROI at 10 years after initiation   **26**   to 1   with cum.savings of $ 263,033
   ROI at 20 years after initiation   **44**   to 1   with cum.savings of $ 438,800

TOTAL SAVINGS   *For an investment of* $ 10,000
   ROI at 10 years after initiation   **32**   to 1   with cum.savings of $ 323,951
   ROI at 20 years after initiation   **67**   to 1   with cum.savings of $ 671,807

DISCOUNTED TOTAL SAVINGS   *For an investment of* $ 10,000
   ROI at 10 years after initiation   **26**   to 1   with cum.savings of $ 263,550
   ROI at 20 years after initiation   **44**   to 1   with cum.savings of $ 440,451

Undiscounted and discounted investments are the same since investment is in the first year

M9 ACE Crew Vent Fan

Cost to support existing program	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
				$/ 1						
Wholesale materiel cost	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
DLR cost	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
'Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	582	582	582	582	582	582	582	582	582	582
Cum w/o Milpers)	38,215	38,215	38,215	38,215	38,215	38,215	38,215	38,215	38,215	38,215
Cum (with Milpers)	38,797	38,797	38,797	38,797	38,797	38,797	38,797	38,797	38,797	38,797

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to support existing program										
Wholesale materiel cost	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
DLR cost	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
'Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	582	582	582	582	582	582	582	582	582	582
Cum w/o Milpers)	38,215	38,215	38,215	38,215	38,215	38,215	38,215	38,215	38,215	38,215
Cum (with Milpers)	38,797	38,797	38,797	38,797	38,797	38,797	38,797	38,797	38,797	38,797

M9 ACE Crew Vent Fan

$/ 1	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to undertake new program										
Non-recurring cost	10,000	0	0	0	0	0	0	0	0	0
Development	10,000	0	0	0	0	0	0	0	0	0
Integration										
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering										
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E										
Data										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
DLR cost	6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	582	588	565	542	521	501	482	463	446	429
Total annual (without Milpers)	6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
Total annual (with Milpers)	7,535	7,555	7,196	6,856	6,532	6,225	5,933	5,655	5,392	5,142
Cum (without Milpers)	6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
Cum (with MilPers)	7,535	7,555	7,196	6,856	6,532	6,225	5,933	5,655	5,392	5,142
Cost to support new design										
Wholesale materiel cost	6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
DLR cost	6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	6	11	17	22	26	31	35	39	43
Cost to support old (phasing out) design										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	582	582	553	526	499	474	451	428	407	386
Ave # of vehicles with old fans	448	426	404	384	365	347	329	313	297	282
Ave. # of vehicles with new fan	0	22	44	64	83	101	119	135	151	166
# of old fan replacements	22	22	21	20	19	18	17	16	16	15
# of new fan replacements	0.0	0.2	0	1	1	1	1	1	2	2

$/ 1	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to undertake new program										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development	0	0	0	0	0	0	0	0	0	0
Integration										
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering										
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E										
Data										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
DLR cost	4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	414	399	385	371	359	347	335	324	314	304
Total annual (without Milpers)	4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
Total annual (with Milpers)	4,904	4,678	4,463	4,259	4,066	3,882	3,707	3,541	3,383	3,233
Cum (without Milpers)	4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
Cum (with MilPers)	4,904	4,678	4,463	4,259	4,066	3,882	3,707	3,541	3,383	3,233
Cost to support new design										
Wholesale materiel cost	4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
DLR cost	4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	47	50	54	57	60	63	65	68	70	73
Cost to support old (phasing out) design										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	367	349	331	315	299	284	270	256	244	231
Ave # of vehicles with old fans	268	255	242	230	218	208	197	187	178	169
Ave. # of vehicles with new fan	180	193	206	218	230	240	251	261	270	279
# of old fan replacements	14	13	13	12	11	11	10	10	9	9
# of new fan replacements	2	2	2	2	2	2	3	3	3	3

ROI(M) Calculations	Time				**M9 ACE Crew Vent Fan**			$/ 1		
Material Savings	YEAR	1	2	3	4	5	6	7	8	9	10

Denominator (Cost to undertake new program)

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Non-recurring cost	10,000	0	0	0	0	0	0	0	0	0
Development	10,000	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)	0	0	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Total Cost to Implement	10,000	0	0	0	0	0	0	0	0	0
Cum Cost to Implement	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Discounted Cost to Implement	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000

Numerator (Delta support cost resulting from new program)

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Cost to support existing program										
Wholesale materiel cost	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
DLR cost	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Cost to support new program										
Wholesale materiel cost	6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
DLR cost	6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)										
Wholesale materiel cost	31,261	31,248	31,583	31,901	32,203	32,490	32,763	33,022	33,268	33,502
DLR cost	31,261	31,248	31,583	31,901	32,203	32,490	32,763	33,022	33,268	33,502
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Total Delta	31,262	31,248	31,583	31,901	32,204	32,491	32,763	33,023	33,269	33,503
Cumulative Delta	31,262	62,510	94,093	125,995	158,198	190,689	223,452	256,475	289,743	323,246
Discounted Cumulative Delta	31,262	61,072	89,814	117,510	144,181	169,852	194,546	218,291	241,111	263,033

Return on Investment

		Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
ROI (Numerator/denominator)		6.3	9.4	12.6	15.8	19.1	22.3	25.6	29.0	32.3
DISCOUNTED ROI		6.1	9.0	11.8	14.4	17.0	19.5	21.8	24.1	26.3

ROI(M) Calculations

Material Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Total Cost to Implement		0	0	0	0	0	0	0	0	0	0
Cum Cost to Implement		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Discounted Cost to Implement		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
DLR cost		38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
DLR cost		4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)											
Wholesale materiel cost		33,724	33,935	34,136	34,326	34,507	34,679	34,843	34,998	35,145	35,285
DLR cost		33,724	33,935	34,136	34,326	34,507	34,679	34,843	34,998	35,145	35,285
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Total Delta		33,725	33,936	34,136	34,327	34,508	34,680	34,843	34,998	35,145	35,286
Cumulative Delta		356,971	390,907	425,043	459,370	493,877	528,557	563,400	598,398	633,544	668,829
Discounted Cumulative Delta		284,086	304,295	323,687	342,291	360,131	377,235	393,629	409,338	424,387	438,800
Return on Investment											
ROI (Numerator/denominator)		35.7	39.1	42.5	45.9	49.4	52.9	56.3	59.8	63.4	66.9
DISCOUNTED ROI		28.4	30.4	32.4	34.2	36.0	37.7	39.4	40.9	42.4	43.9

ROI(T) Calculations

Time — M9 ACE Crew Vent Fan — $/ 1

Total Savings	YEAR	1	2	3	4	5	6	7	8	9	10
						$/1000					
Denominator (Cost to undertake new program)											
Non-recurring cost		10,000	0	0	0	0	0	0	0	0	0
Development		10,000	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Installation (field labor)		0	0	0	0	0	0	0	0	0	0
Total cost to implement		10,000	0	0	0	0	0	0	0	0	0
Cumulative total cost to implement		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Discounted cumulative total cost		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
DLR cost		38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		582	582	582	582	582	582	582	582	582	582
Cost to support new program											
Wholesale materiel cost		6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
DLR cost		6,953	6,966	6,632	6,313	6,011	5,724	5,451	5,192	4,946	4,712
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		582	588	565	542	521	501	482	463	446	429
Delta support cost											
Wholesale materiel cost		31,261	31,248	31,583	31,901	32,203	32,490	32,763	33,022	33,268	33,502
DLR cost		31,261	31,248	31,583	31,901	32,203	32,490	32,763	33,022	33,268	33,502
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	-6	18	40	61	82	101	119	136	153
Total delta cost to support		31,262	31,242	31,601	31,941	32,265	32,572	32,864	33,142	33,405	33,656
Cumulative total delta cost to support		31,262	62,504	94,105	126,047	158,312	190,884	223,748	256,890	290,295	323,951
Discounted cumulative delta cost		31,262	61,066	89,825	117,556	144,278	170,013	194,783	218,613	241,527	263,550
Return on Investment											
ROI (Numerator/denominator)		3.1	6.3	9.4	12.6	15.8	19.1	22.4	25.7	29.0	32.4
Discounted ROI		3.1	6.1	9.0	11.8	14.4	17.0	19.5	21.9	24.2	26.4

ROI(T) Calculations

Total Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Installation (field labor)		0	0	0	0	0	0	0	0	0	0
Total cost to implement		0	0	0	0	0	0	0	0	0	0
Cumulative total cost to implement		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Discounted cumulative total cost		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
DLR cost		38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214	38,214
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		582	582	582	582	582	582	582	582	582	582
Cost to support new program											
Wholesale materiel cost		4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
DLR cost		4,490	4,279	4,078	3,888	3,707	3,535	3,372	3,217	3,069	2,929
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		414	399	385	371	359	347	335	324	314	304
Delta support cost											
Wholesale materiel cost		33,724	33,935	34,136	34,326	34,507	34,679	34,843	34,998	35,145	35,285
DLR cost		33,724	33,935	34,136	34,326	34,507	34,679	34,843	34,998	35,145	35,285
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		169	183	198	211	224	236	247	258	269	279
Total delta cost to support		33,893	34,119	34,334	34,538	34,731	34,916	35,090	35,256	35,414	35,564
Cumulative total delta cost to support		357,844	391,963	426,297	460,835	495,567	530,482	565,572	600,829	636,243	671,807
Discounted cumulative delta cost		284,707	305,025	324,530	343,248	361,204	378,425	394,935	410,760	425,923	440,451
Return on Investment											
ROI (Numerator/denominator)		35.8	39.2	42.6	46.1	49.6	53.0	56.6	60.1	63.6	67.2
Discounted ROI		28.5	30.5	32.5	34.3	36.1	37.8	39.5	41.1	42.6	44.0

Integrated Petroleum Data System (IPOLDS)

- ◆ Cover chart

- ◆ Return on investment (ROI) analysis
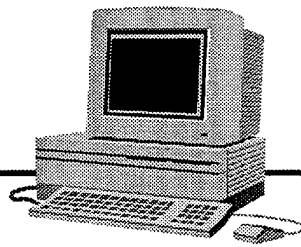
Integrated Petroleum Data System (IPOLDS)

PC-based system to identify lower cost POL products

$M **Discounted Savings**

Cumulative Material Savings

10yr ROI 20:1
20yr ROI 39:1

Cumulative Investment

Year

Relative Cost

IPOLDS   Manual Process
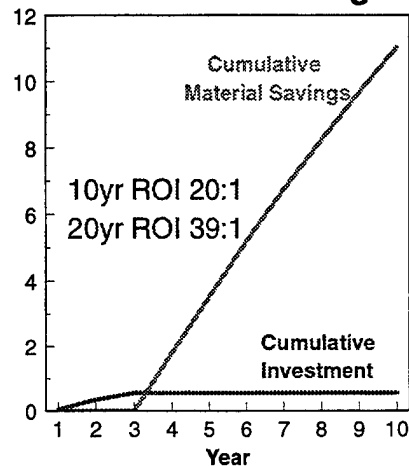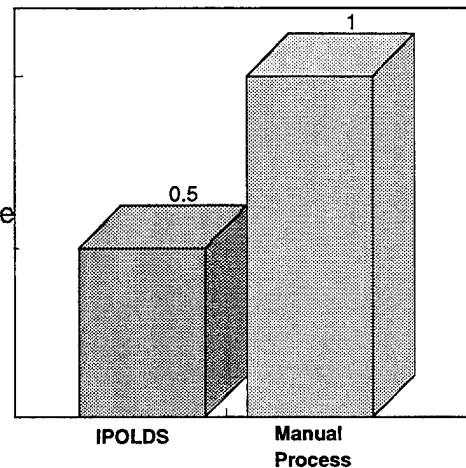
Data Source: TACOM, AMSTA-RBFL OSCR

Integrated Petroleum Data System (IPOLDS)

- **BACKGROUND:**
  - Currently have significant dependence on proprietary or Military Specification products by manually using Technical Manuals and Lube Orders to determine acceptable products or substitutes
  - A year-long Defense General Supply Center study in FY 1992 indicated that
    - Proprietary products cost 300%-400% more than equivalent Mil. Spec. products
    - ~65% of proprietary products had Mil. Spec. equivalent
- **OBJECTIVE:**
  - Provide automated system to identify lower-cost alternative and common use POL products
- **SOURCE OF SAVINGS:**
  - Reduced cost of materials

Project Title: **Integrated Petroleum, Oils, and Lubricants Data System (IPOLDS)**

Source: TACOM, AMSTA-RBFL OSCR project

ASSUMPTIONS:

1) Objective: Identify optimum POL products to meet technical requirements and reduce cost. The personal computer based software would identify commercial standards and products available to substitute for military specification products or for sole source proprietary products. It would also identify single products for multiple applications and host nation equivalent products.

2) All costs are expressed in FY ___95___ dollars

3) Dollars expressed in ___$1,000___ s throughout spreadsheet except for this page.

4) OMB CIR A-94 discount rate = ___4.8%___ for investments 3/95-2/96 with maturity of 10-20 years

5) A FY1992 study indicated that $6.4M was spent on proprietary products and that proprietary products had a 300% to 400% markup over the military specification equivalents.
It is assumed that there are equivalent mil. spec. products for _65%_ of the proprietary products being used and that the mil spec equivalents cost _50%_ less than the proprietary products. Effects of use of commercial standards or reduction of inventory through identification of multiple use products are not inclulde in this analysis.

6) Data research, software development, and fielding will require 3 years

7) The annual material cost for proprietary POL products is assumed to be $ ___6,400,000___ for the baseline case based on the FY1992 study (see 5 above).

8) Software maintenance costs beyond 10th yr. were not provided by AMSTA. Extrapolating data provided yields an annual increase of $ 2,667 This is assumed to account for the increasing size of the data base and new products.

RESULTS:

		For an investment of	$	585,000
1) ROI at 10 years, material only	24.9 to 1	Cumulative savings of	$	14,559,710
2) ROI at 20 years, material only	60.4 to 1	Cumulative savings of	$	35,359,610

DISCOUNTED				
		For discounted investment of	$	550,218
3) ROI at 10 yr, mtl. discounted	20 to 1	Cumulative savings of	$	11,022,723
4) ROI at 20 yr, mtl. discounted	39.3 to 1	Cumulative savings of	$	21,622,364

TOTAL SAVINGS   Not available since no MILPERS savings provided

Integrated Petroleum, Oils, and Lubricants Data System

Cost to support existing program	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
					$/ 1000					
Wholesale materiel cost	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
DLR cost	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cum w/o Milpers)	6,400	12,800	19,200	25,600	32,000	38,400	44,800	51,200	57,600	64,000
Cum (with MIlpers)	6,400	12,800	19,200	25,600	32,000	38,400	44,800	51,200	57,600	64,000

Cost to support existing program	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Wholesale materiel cost	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
DLR cost	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cum w/o Milpers)	70,400	76,800	83,200	89,600	96,000	102,400	108,800	115,200	121,600	128,000
Cum (with Milpers)	70,400	76,800	83,200	89,600	96,000	102,400	108,800	115,200	121,600	128,000

Integrated Petroleum, Oils, and Lubricants Data System

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to undertake new program										
Non-recurring cost	44	316	225	0	0	0	0	0	0	0
Development										
Integration										
H/W engineering										
S/W engineering	44	316	225							
Integration assets										
Regression T&E										
Data										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	6,400	6,400	6,400	4,320	4,320	4,320	4,320	4,320	4,320	4,320
DLR cost	6,400	6,400	6,400	4,320	4,320	4,320	4,320	4,320	4,320	4,320
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	28	29	36	37	38	43	44
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	6,400	6,400	6,400	4,348	4,349	4,356	4,357	4,358	4,363	4,364
Total annual (with Milpers)	6,400	6,400	6,400	4,348	4,349	4,356	4,357	4,358	4,363	4,364
Cum (without Milpers)	6,400	12,800	19,200	23,548	27,897	32,253	36,610	40,968	45,331	49,695
Cum (with MilPers)	6,400	12,800	19,200	23,548	27,897	32,253	36,610	40,968	45,331	49,695
Cost to support new design										
Wholesale materiel cost	0	0	0	4,320	4,320	4,320	4,320	4,320	4,320	4,320
DLR cost				4,320	4,320	4,320	4,320	4,320	4,320	4,320
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0
Consumables										
Depot-level maint. cost*		0	0	28	29	36	37	38	43	44
Milpers cost										
Cost to support old (phasing out) design										
Wholesale materiel cost	6,400	6,400	6,400	0	0	0	0	0	0	0
DLR cost	6,400	6,400	6,400							
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost										

* Depot level maint. cost is cost of post production software support/maintenance

AMSTA-RBFL investment data										
Investment Funding	44	316	225	28	29	36	37	38	43	44
Annual sustainment Delta					1	7	1	1	5	1
Ave. Ann. Delta										

Integrated Petroleum, Oils, and Lubricants Data System

$/ 1000	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to undertake new program										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development										
Integration										
H/W engineering										
S/W engineering										
Integration assets										
Regression T&E										
Data										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320
DLR cost	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	47	49	52	55	57	60	63	65	68	71
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	4,367	4,369	4,372	4,375	4,377	4,380	4,383	4,385	4,388	4,391
Total annual (with Milpers)	4,367	4,369	4,372	4,375	4,377	4,380	4,383	4,385	4,388	4,391
Cum (without Milpers)	54,062	58,431	62,803	67,178	71,555	75,935	80,318	84,703	89,091	93,482
Cum (with MilPers)	54,062	58,431	62,803	67,178	71,555	75,935	80,318	84,703	89,091	93,482
Cost to support new design										
Wholesale materiel cost	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320
DLR cost	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables										
Depot-level maint. cost*	47	49	52	55	57	60	63	65	68	71
Milpers cost										
Cost to support old (phasing out) design										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost										
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost										

Extrapolated Investment - Software Maintenance

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Investment Funding	47	49	52	55	57	60	63	65	68	71
Annual sustainment Delta	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67
Ave. Ann. Delta	2.67	average increase for first ten years								

ROI(M) Calculations

Integrated Petroleum, Oils, and Lubricants Data System

Material Savings	YEAR	1	2	3	4	5	6	7	8	9	10
					$/ 1000						
Denominator (Cost to undertake new program)											
Non-recurring cost		44	316	225	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		44	316	225	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Total Cost to Implement		44	316	225	0	0	0	0	0	0	0
Cum Cost to Implement		44	360	585	585	585	585	585	585	585	585
Discounted Cost to Implement		44	345	550	550	550	550	550	550	550	550
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
DLR cost		6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		6,400	6,400	6,400	4,320	4,320	4,320	4,320	4,320	4,320	4,320
DLR cost		6,400	6,400	6,400	4,320	4,320	4,320	4,320	4,320	4,320	4,320
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)											
Wholesale materiel cost		0	(0)	(0)	2,080	2,080	2,080	2,080	2,080	2,080	2,080
DLR cost		0	0	0	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Replen buy cost		0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Reparables		0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	(0)	(0)	0	0	0	0	0	0	0
Total Delta		0	(0)	(0)	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Cumulative Delta		0	(0)	(0)	2,080	4,160	6,240	8,320	10,400	12,480	14,560
Discounted Cumulative Delta		0	(0)	(0)	1,806	3,528	5,172	6,739	8,235	9,662	11,023
Return on Investment											
ROI (Numerator / denominator)			0.0	0.0	3.6	7.1	10.7	14.2	17.8	21.3	24.9
DISCOUNTED ROI			0.0	0.0	3.3	6.4	9.4	12.2	15.0	17.6	20.0

ROI(M) Calculations

Integrated Petroleum, Oils, and Lubricants Data System

Material Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Total Cost to Implement		0	0	0	0	0	0	0	0	0	0
Cum Cost to Implement		585	585	585	585	585	585	585	585	585	585
Discounted Cost to Implement		550	550	550	550	550	550	550	550	550	550
Numerator (Delta support cost resulting from new program)											
Cost to support existing progra											
Wholesale materiel cost		6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
DLR cost		6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320
DLR cost		4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)											
Wholesale materiel cost		2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080
DLR cost		2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Replen buy cost		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Reparables		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Total Delta		2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Cumulative Delta		16,640	18,720	20,800	22,880	24,960	27,040	29,120	31,200	33,280	35,360
Discounted Cumulative Delta		12,321	13,560	14,741	15,869	16,944	17,970	18,949	19,882	20,773	21,622
Return on Investment											
ROI (Numerator / denominator)		28.4	32.0	35.6	39.1	42.7	46.2	49.8	53.3	56.9	60.4
DISCOUNTED ROI		22.4	24.6	26.8	28.8	30.8	32.7	34.4	36.1	37.8	39.3

ROI(T) Calculations

Total Savings	Time YEAR	1	2	3	4	5	6	7	8	9	10

Integrated Petroleum, Oils, and Lubricants Data System

$/ 1000

Denominator (Cost to undertake new program)

	1	2	3	4	5	6	7	8	9	10
Non-recurring cost	44	316	225	0	0	0	0	0	0	0
Development	0	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	44	316	225	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)	0	0	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Installation (field labor)	0	0	0	0	0	0	0	0	0	0
Total cost to implement	44	316	225	0	0	0	0	0	0	0
Cumulative total cost to implement	44	360	585	585	585	585	585	585	585	585
Discounted cumulative total cost	44	345	550	550	550	550	550	550	550	550

Numerator (Delta support cost resulting from new program)

Cost to support existing program

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
DLR cost	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0

Cost to support new program

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	6,400	6,400	6,400	4,320	4,320	4,320	4,320	4,320	4,320	4,320
DLR cost	6,400	6,400	6,400	4,320	4,320	4,320	4,320	4,320	4,320	4,320
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0

Delta support cost

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	0	(0)	(0)	2,080	2,080	2,080	2,080	2,080	2,080	2,080
DLR cost	0	0	0	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Replen buy cost	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Reparables	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	(0)	(0)	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total delta cost to support	0	(0)	(0)	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Cumulative total delta cost to support	0	(0)	(0)	2,080	4,160	6,240	8,320	10,400	12,480	14,560
Discounted cumulative delta cost	0	(0)	(0)	1,806	3,528	5,172	6,739	8,235	9,662	11,023

Return on Investment

	1	2	3	4	5	6	7	8	9	10
ROI (Numerator/denominator)	0.0	0.0	0.0	3.6	7.1	10.7	14.2	17.8	21.3	24.9
Discounted ROI	0.0	0.0	0.0	3.3	6.4	9.4	12.2	15.0	17.6	20.0

ROI(T) Calculations — Integrated Petroleum, Oils, and Lubricants Data System

Total Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Installation (field labor)		0	0	0	0	0	0	0	0	0	0
Total cost to implement		0	0	0	0	0	0	0	0	0	0
Cumulative total cost to implement		585	585	585	585	585	585	585	585	585	585
Discounted cumulative total cost		550	550	550	550	550	550	550	550	550	550
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
DLR cost		6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320
DLR cost		4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Delta support cost											
Wholesale materiel cost		2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080
DLR cost		2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Replen buy cost		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Reparables		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Total delta cost to support		2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Cumulative total delta cost to support		16,640	18,720	20,800	22,880	24,960	27,040	29,120	31,200	33,280	35,360
Discounted cumulative delta cost		12,321	13,560	14,741	15,869	16,944	17,970	18,949	19,882	20,773	21,622
Return on Investment											
ROI (Numerator/denominator)		28.4	32.0	35.6	39.1	42.7	46.2	49.8	53.3	56.9	60.4
Discounted ROI		22.4	24.6	26.8	28.8	30.8	32.7	34.4	36.1	37.8	39.3

M1A1 Tank — M256 120mm Cannon Tube and Breech Life Extension

- ◆ Cover chart

- ◆ Return on investment (ROI) analysis
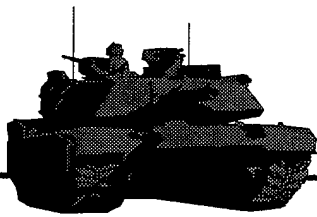
M256 120mm Cannon Tube and Breech Life Extension

Discounted Savings

$ M

- 14
- 12
- 10
- 8
- 6
- 4
- 2
- 0

Cumulative Material Savings

10yr ROI 16:1
20yr ROI 26:1

Cumulative Investment

1 2 3 4 5 6 7 8 9 10
Year

Annual Savings

$ K

- 300
- 200
- 100
- 0

$K

- 3,000
- 2,000
- 1,000
- 0

262 New
131 Old
Breeches

2,897 New
1,449 Old
Tubes
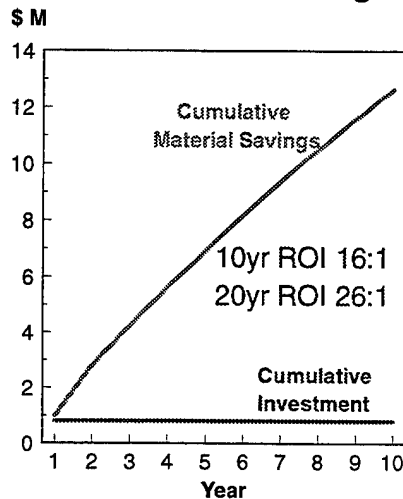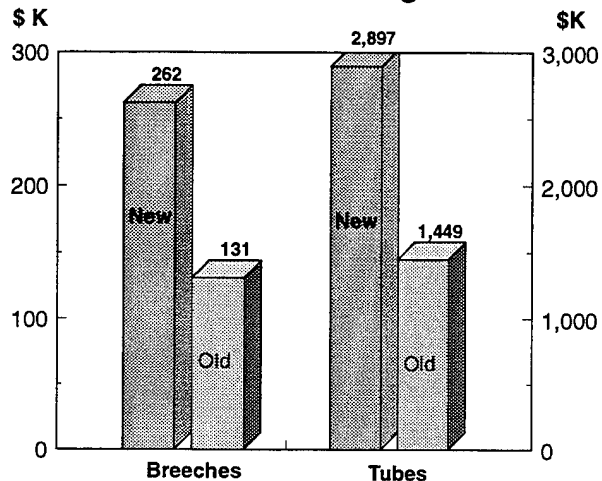
Data Source: TACOM Team OSCAR

M1A1 Tank – M256 120mm Cannon Tube and Breech Life Extension

- **BACKGROUND:**
  - M1A1 tank cannon tube and breech service life are based on rounds fired. The service life is derived from stresses associated with combat round propellant charges. Lower-pressure training rounds exert lower stresses on the tubes and breeches; thus their service life should be longer training rounds are used.
- **OBJECTIVE:**
  - Extend the cannon tube and breech service life by performing testing to establish a factor to account for low-pressure rounds used during training
- **SOURCE OF SAVINGS:**
  - Reduced consumption of tubes and breeches

Project Title: **M256 120mm Cannon Tube&Breech Life Extension**
Source: Army - TACOM Team-OSCR

ASSUMPTIONS:

1) Objective: Extend the service life of the M1A1 tank's cannon tube by performing testing to establish a derating factor to account for lower stress of low pressure rounds used during training.

2) All costs are are expressed in FY   95   dollars

3) Dollars expressed in __$1,000__ s throughout spreadsheet except this page.

4) OMB CIR A-94 discount rate = __4.8%__ for investments 3/95-2/96 with maturity of 10 years

5) Derating factor is assumed to be   0.5   of Effective Full Charge rounds fired for this analysis.
This results in a rounds per replacement factor of ___2___ (i.e. doubling component life)

6) Preparation, testing, and determination of derating factor requires 6 months with immediate implementation.
Thus, half of first year of the proposed program would be at old rate and the other half at the new rate

7) Data:

| AMDR Prices: | Tube | $ 53,331 |
| | Breech | $ 44,160 |

Ammunition training requirements shown on **Existing program** sheet
Development data shown on **Alternative program** sheet

RESULTS:

MATERIAL ONLY

			For an investment of $	800,000
1) ROI at 10 years, material only	**19**	to 1	with cum.savings of $	15,539,690
2) ROI at 20 years, material only	**39**	to 1	with cum.savings of $	31,338,608

DISCOUNTED MATERIAL ONLY

			For investment of $	800,000
3) ROI at 10 years after initiation	**16**	to 1	for cum. savings of $	12,635,817
4) ROI at 20 years after initiation	**26**	to 1	for cum. savings of $	20,714,104

TOTAL SAVINGS   NO MILPERS DATA AVAILABLE

			For investment of $	800,000
5) ROI at 10 years after initiation	**19**	to 1	for cum. savings of $	15,539,690
6) ROI at 20 years after initiation	**39**	to 1	for cum. savings of $	31,338,608

DISCOUNTED TOTAL SAVINGS

			For investment of $	800,000
7) ROI at 10 years after initiation	**16**	to 1	for cum. savings of $	12,635,817
8) ROI at 20 years after initiation	**26**	to 1	for cum. savings of $	20,714,104

Undiscounted and discounted investment are the same since investment is in the first year.

M256 120mm Cannon Tube&Breech Life Extension

Cost to support existing program	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
					$/ 1000					
Wholesale materiel cost	3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
DLR cost										
Replen buy cost	3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Reparables										
Consumables	3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Depot-level maint. cost										
Milpers cost										
Cum w/o Milpers)	3,961	7,782	10,942	14,101	17,261	20,421	23,581	26,741	29,900	33,060
Cum (with Milpers)	3,961	7,782	10,942	14,101	17,261	20,421	23,581	26,741	29,900	33,060

Training and use data

	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Ammo Training Rqmts.	252,000	243,000	201,000	201,000	201,000	201,000	201,000	201,000	201,000	201,000
Breeches Estimated	7.44	7.18	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94
Rounds/breech	33870.97	33844	33838.38	33838.38	33838.38	33838.38	33838.38	33838.38	33838.38	33838.38
Tubes Estimated	68.12	65.69	54.33	54.33	54.33	54.33	54.33	54.33	54.33	54.33
Rounds/Tube	3,699	3,699	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700
Breech Replacement cost	329	317	262	262	262	262	262	262	262	262
Tube Replacement cost	3,633	3,503	2,897	2,897	2,897	2,897	2,897	2,897	2,897	2,897
Total	3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160

Source: OSCR Investment Inititaive Economic Analysis
Title: To Extend Service Life of M256 120MM Cannon Tube
Dated: 23 February 1995
Organization: AMSTA-AC-WSH Rock Island Arsonal
POC: Jerry Koester

M256 120mm Cannon Tube&Breech Life Extension

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to support existing program										
Wholesale materiel cost	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
DLR cost										
Replen buy cost	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Reparables										
Consumables	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Depot-level maint. cost										
Milpers cost										
Cum w/o Milpers)	36,220	39,380	42,539	45,699	48,859	52,019	55,179	58,338	61,498	64,658
Cum (with MIlpers)	36,220	39,380	42,539	45,699	48,859	52,019	55,179	58,338	61,498	64,658

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Ammo Training Rqmts.	201,000	201,000	201,000	201,000	201,000	201,000	201,000	201,000	201,000	201,000
Breeches Estimated	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94
Rounds/breech	33838.38	33838.38	33838.38	33838.38	33838.38	33838.38	33838.38	33838.38	33838.38	33838.38
Tubes Estimated	54.33	54.33	54.33	54.33	54.33	54.33	54.33	54.33	54.33	54.33
Rounds/Tube	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700
Breech Replacement cost	262	262	262	262	262	262	262	262	262	262
Tube Replacement cost	2,897	2,897	2,897	2,897	2,897	2,897	2,897	2,897	2,897	2,897
Total	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160

M256 120mm Cannon Tube&Breech Life Extension

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to undertake new program										
Non-recurring cost	800	0	0	0	0	0	0	0	0	0
Development										
Integration										
H/W engineering	20									
S/W engineering										
Integration assets	300									
Regression T&E	480									
Data										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Total annual (with Milpers)	2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Cum (without Milpers)	2,971	4,881	6,461	8,041	9,621	11,201	12,781	14,361	15,941	17,520
Cum (with MilPers)	2,971	4,881	6,461	8,041	9,621	11,201	12,781	14,361	15,941	17,520
Cost to support new design										
Wholesale materiel cost	990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost										
Replen buy cost	990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables										
Consumables	990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost										
Milpers cost										
Cost to support old (phasing out) design										
Wholesale materiel cost	1,981	0	0	0	0	0	0	0	0	0
DLR cost										
Replen buy cost	1,981	0	0	0	0	0	0	0	0	0
Reparables										
Consumables	1,981	0								
Depot-level maint. cost										
Milpers cost										

Development Data

H/W engineering	**$**	**20**
Fixture Design	15	
Safe Service life Eval/Rpt	5	
Integration Assets	**$**	**300**
Fixture Manufacture	270	
Specimen Cut & Machine	30	
Regression Testing	**$**	**480**
Pre-test Imspections	20	
Fatugue Test Operation	450	
Post-test inspections	10	

Source: OSCR Investment Inititaive Economic Analysis
Title: To Extend Service Life of M256 120MM Cannon Tube
Dated: 23 February 1995
Organization: AMSTA-AC-WSH Rock Island Arsonal
POC: Jerry Koester

$/ 1000	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to undertake new program										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development										
Integration										
H/W engineering										
S/W engineering										
Integration assets										
Regression T&E										
Data										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Total annual (with Milpers)	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Cum (without Milpers)	19,100	20,680	22,260	23,840	25,420	27,000	28,580	30,160	31,739	33,319
Cum (with MilPers)	19,100	20,680	22,260	23,840	25,420	27,000	28,580	30,160	31,739	33,319
Cost to support new design										
Wholesale materiel cost	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost										
Replen buy cost	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables										
Consumables	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost										
Milpers cost										
Cost to support old (phasing out) design										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost										
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

ROI(M) Calculations Time   M256 120mm Cannon Tube&Breech Life Extension

Material Savings	YEAR	1	2	3	4	5	6	7	8	9	10
					$/ 1000						
Denominator (Cost to undertake new program)											
Non-recurring cost		800	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		20	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		300	0	0	0	0	0	0	0	0	0
Regression T&E		480	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Total Cost to Implement		800	0	0	0	0	0	0	0	0	0
Cum Cost to Implement		800	800	800	800	800	800	800	800	800	800
Discounted Cost to Implement		800	800	800	800	800	800	800	800	800	800
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)											
Wholesale materiel cost		990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Total Delta		990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Cumulative Delta		990	2,901	4,480	6,060	7,640	9,220	10,800	12,380	13,960	15,540
Discounted Cumulative Delta		990	2,813	4,252	5,624	6,934	8,184	9,376	10,514	11,600	12,636
Return on Investment											
ROI (Numerator/denominator)			3.6	5.6	7.6	9.6	11.5	13.5	15.5	17.4	19.4
DISCOUNTED ROI			3.5	5.3	7.0	8.7	10.2	11.7	13.1	14.5	15.8

ROI(M) Calculations

Material Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Total Cost to Implement		0	0	0	0	0	0	0	0	0	0
Cum Cost to Implement		800	800	800	800	800	800	800	800	800	800
Discounted Cost to Implement		800	800	800	800	800	800	800	800	800	800
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good											
Wholesale materiel cost		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Total Delta		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Cumulative Delta		17,120	18,699	20,279	21,859	23,439	25,019	26,599	28,179	29,759	31,339
Discounted Cumulative Delta		13,624	14,568	15,468	16,327	17,146	17,928	18,674	19,386	20,066	20,714
Return on Investment											
ROI (Numerator/denominate		21.4	23.4	25.3	27.3	29.3	31.3	33.2	35.2	37.2	39.2
DISCOUNTED ROI		17.0	18.2	19.3	20.4	21.4	22.4	23.3	24.2	25.1	25.9

ROI(T) Calculations

Time   M256 120mm Cannon Tube&Breech Life Extension

Total Savings	YEAR	1	2	3	4	5	6	7	8	9	10
						$/ 1000					

Denominator (Cost to undertake new program)

	1	2	3	4	5	6	7	8	9	10
Non-recurring cost	800	0	0	0	0	0	0	0	0	0
Development	0	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	20	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	300	0	0	0	0	0	0	0	0	0
Regression T&E	480	0	0	0	0.	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)	0	0	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Installation (field labor)	0	0	0	0	0	0	0	0	0	0
Total cost to implement	800	0	0	0	0	0	0	0	0	0
Cumulative total cost to implement	800	800	800	800	800	800	800	800	800	800
Discounted cumulative total cost	800	800	800	800	800	800	800	800	800	800

Numerator (Delta support cost resulting from new program)

Cost to support existing program

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	3,961	3,820	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0

Cost to support new program

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	2,971	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0

Delta support cost

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total delta cost to support	990	1,910	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Cumulative total delta cost to support	990	2,901	4,480	6,060	7,640	9,220	10,800	12,380	13,960	15,540
Discounted cumulative delta cost	990	2,813	4,252	5,624	6,934	8,184	9,376	10,514	11,600	12,636

Return on Investment

	1	2	3	4	5	6	7	8	9	10
ROI (Numerator/denominator)	1.2	3.6	5.6	7.6	9.6	11.5	13.5	15.5	17.4	19.4
Discounted ROI	1.2	3.5	5.3	7.0	8.7	10.2	11.7	13.1	14.5	15.8

ROI(T) Calculations

M256 120mm Cannon Tube&Breech Life Extension

| Total Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Installation (field labor)		0	0	0	0	0	0	0	0	0	0
Total cost to implement		0	0	0	0	0	0	0	0	0	0
Cumulative total cost to implement		800	800	800	800	800	800	800	800	800	800
Discounted cumulative total cost		800	800	800	800	800	800	800	800	800	800
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160	3,160
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Delta support cost											
Wholesale materiel cost		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
DLR cost		0	0	0	0	0	0	0	0	0	0
Replen buy cost		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Total delta cost to support		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Cumulative total delta cost to support		17,120	18,699	20,279	21,859	23,439	25,019	26,599	28,179	29,759	31,339
Discounted cumulative delta cost		13,624	14,568	15,468	16,327	17,146	17,928	18,674	19,386	20,066	20,714
Return on Investment											
ROI (Numerator/denominator)		21.4	23.4	25.3	27.3	29.3	31.3	33.2	35.2	37.2	39.2
Discounted ROI		17.0	18.2	19.3	20.4	21.4	22.4	23.3	24.2	25.1	25.9

Solargizer Battery Maintenance System

- ◆ Cover chart

- ◆ Return on investment (ROI) analysis
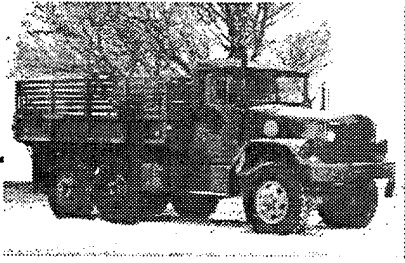
Solargizer Battery Maintenance System

Discounted Savings
$M

Cumulative Material Savings

10yr ROI 14:1
20yr ROI 24:1

Cumulative Investment

Year

Battery Life
Years

5

With Solargizer

1

Without Solargizer
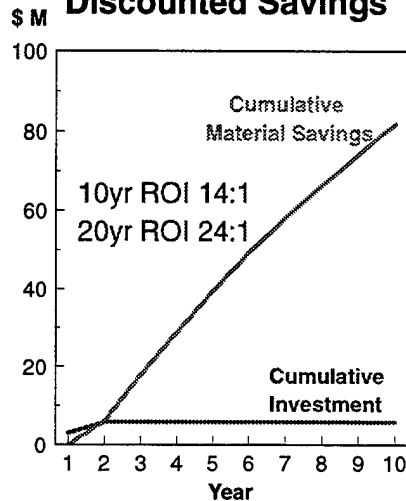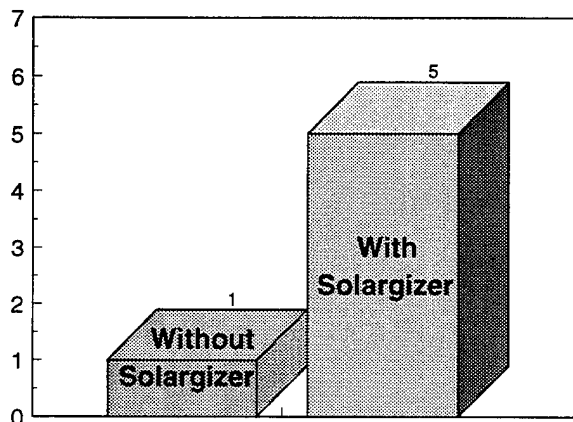
Data Source: III CORPS / AMC-FAST Ft. Hood

Solargizer Battery Maintenance System

- **BACKGROUND:**
  - US Army III Corps is concerned about the high O&S costs associated with ground vehicle lead-acid batteries in terms of short life, disposal cost, and preventative maintenance. Army Research Lab conducted tests of commercial devices to improve battery life and concluded the Solargizer was the optimum choice. The Solargizer electronically removes and prevents sulfate buildup on internal battery plates
- **OBJECTIVE:**
  - Install Solargizer battery maintenance systems on ground vehicles in order to extend battery life
- **SOURCE OF SAVINGS:**
  - Reduced consumption of batteries

Project Title: **Solargizer Battery Maintenance System**

Source: Army, III Corps./AMC-FAST, Ft. Hood, TX

1) Objective: Reduce operating costs by extending 12 volt battery life. The proposed change incorporates a solar powered device that electronically cleans and conditions the battery's internal plates to remove and prevent sulfate buildup.

2) Dollars expressed in FY95   **$ 1,000** s throughout this spreadsheet <u>except</u> this page

3) OMB CIR A-94 discount rate =   <u>4.8%</u> for investments 3/95-2/96 with maturity of 10-20 years

4) Data from Ft. Hood Battery Management Task Force Final Report 30 Sept. 94:

     a.   (page D-1) Current battery set (2 batteries) life is   <u>1</u>   year

     b.   Battery life with Solargizer life is estimated at   <u>5</u>   years. However, battery life with SOLARGIZER is not validated through long term Army testing. Test data shows control of sulfation and associated improved ability to fully recharge - both indicate increased battery life.

     c.   (page D-2) Battery set replacement due to physical damage {annually} is   **15%**   The same damage replacement rate is assumed for existing and alternate program.

     d.   (page D2, D-3) Battery set cost (2 each 12 V batteries) is   **$ 320.00**

     - e.   (page D-1) Total battery sets for Ft. Hood is   <u>20,000</u>   and for all of III Corps is   <u>40,000</u>   Analysis is based on all of III Corps.

     f.   (page D-3) Cost of Solargizer with direct purchase from supplier with no DLA involvement for initial procurement is assumed to be   **$ 148.50**

     g.   Reference telephone discussion with R.J. Holly - the installation time for wheeled vehicles is 0.5 hr. labor (2 mil. people, normally the vehicle crew) and 1.0 hour (2 people) for tracked vehicles Thus, military installation is assumed to be   **1.25**   person hours

     h.   Note: PulseTech brochure page 5 indicates that the M1-A1 Abram's tank requires 3 battery sets and a Lexan frame to protect the solar cells may be needed @ $135. This is a small % of total cost (i.e. $135 x 1/3 of Abram battery sets) and is ignored.

5) Based on discussions with Mr.R.J. Holly it is assumed that installation of Solargizers can be done in   <u>2</u>   years at rate of: <u>20,000</u>   battery sets per year.

6) All physical damage failures in non-Solargizer equipped vehicles will be replaced as part of installation program.

7) Physical damage failures to new batteries installed with Solargizers are proportional to number installed (i.e. 1st year ~ 25% of 15% occurrence, 2nd year 75% of 15% occurrences)

8) Due to affects of 15% physical damage replacements, the annual battery set replacement rate after the 7th year is assumed to be   <u>20%</u>

9) Military labor rate is assumed   <u>$ 17.50</u>

10) Normal battery maintenance is assumed to be 3 recharges per year @ 1 person hour for annual total of: **3.0**   person hrs.

11) Battery replacement is assumed to require   <u>0.5</u>   person hours to diagnose and replace.

12) Solargizer equipped vehicles are assumed to require the same recharging as in 10) above and replacement as stated in 4) b. above

13) Life of SOLARGIZER and rate of damage to solar panels is not known and would raise O&S costs. The effect on unit price (line 4-f. above) of a large buy like line 4-e. above should drive the unit cost down. These effects are assumed to be offsetting.

RESULTS:

MATERIAL ONLY

1) ROI M at 10 years	17 to 1	For an investment of	$ 5,940,000
		Cumulative savings of	$ 103,520,000
2) ROI M at 20 years	37 to 1	For an investment of	$ 5,940,000
		Cumulative savings of	$ 218,720,000

DISCOUNTED, MATERIALS ONLY

1) ROI M at 10 years	14 to 1	For an investment of	$ 5,803,294
		Cumulative savings of	$ 81,849,174
2) ROI M at 20 years	24 to 1	For an investment of	$ 5,803,294
		Cumulative savings of	$ 140,555,159

TOTAL SAVINGS

1) ROI T at 10 years	18 to 1	For an investment of	$ 5,940,000
		Cumulative savings of	$ 105,825,625
2) ROI T at 20 years	38 to 1	For an investment of	$ 5,940,000
		Cumulative savings of	$ 223,650,625

DISCOUNTED, TOTAL SAVINGS

1) ROI T at 10 years	19 to 1	For an investment of	$ 5,803,294
		Cumulative savings of	$ 110,934,245
2) ROI T at 20 years	40 to 1	For an investment of	$ 5,803,294
		Cumulative savings of	$ 234,444,301

$/ 1000   Solargizer Battery Maintenance System

	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to support existing program										
Wholesale materiel cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
DLR cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	350	350	350	350	350	350	350	350	350	350
Cum w/o Milpers)	14,720	29,440	44,160	58,880	73,600	88,320	103,040	117,760	132,480	147,200
Cum (with Milpers)	15,070	30,140	45,210	60,280	75,350	90,420	105,490	120,560	135,630	150,700

$/ 1000

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to support existing program										
Wholesale materiel cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
DLR cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	350	350	350	350	350	350	350	350	350	350
Cum w/o Milpers)	161,920	176,640	191,360	206,080	220,800	235,520	250,240	264,960	279,680	294,400
Cum (with Milpers)	165,770	180,840	195,910	210,980	226,050	241,120	256,190	271,260	286,330	301,400

$/ 1000   **Solargizer Battery Maintenance System**

	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to undertake new program										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development		..								
Integration										
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	3,408	3,408	0	0	0	0	0	0	0	0
Installs (H/W)	2,970	2,970								
Installation (depot labor)	0	0								
Installation (field labor)	438	438								
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	14,720	8,320	1,920	1,920	1,920	2,400	2,880	3,200	3,200	3,200
DLR cost	14,720	8,320	1,920	1,920	1,920	2,400	2,880	3,200	3,200	3,200
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	403	228	53	53	53	66	79	88	88	88
Total annual (without Milpers)	14,720	8,320	1,920	1,920	1,920	2,400	2,880	3,200	3,200	3,200
Total annual (with Milpers)	15,123	8,548	1,973	1,973	1,973	2,466	2,959	3,288	3,288	3,288
Cum (without Milpers)	14,720	23,040	24,960	26,880	28,800	31,200	34,080	37,280	40,480	43,680
Cum (with MilPers)	15,123	23,670	25,643	27,615	29,588	32,053	35,012	38,299	41,587	44,874
Cost to support new design										
Wholesale materiel cost	480	1,440	1,920	1,920	1,920	2,400	2,880	3,200	3,200	3,200
DLR cost	480	1,440	1,920	1,920	1,920	2,400	2,880	3,200	3,200	3,200
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost	13	39	53	53	53	66	79	88	88	88
Cost to support old (phasing out) design										
Wholesale materiel cost	14,240	6,880	0	0	0	0	0	0	0	0
DLR cost	14,240	6,880								
Replen buy cost	0	0								
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost	389	188								

$/ 1000

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to undertake new program										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development										
Integration										
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)		-								
Cost to support new program (su										
Wholesale materiel cost	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
DLR cost	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	88	88	88	88	88	88	88	88	88	88
Total annual (without Milpers)	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
Total annual (with Milpers)	3,288	3,288	3,288	3,288	3,288	3,288	3,288	3,288	3,288	3,288
Cum (without Milpers)	46,880	50,080	53,280	56,480	59,680	62,880	66,080	69,280	72,480	75,680
Cum (with MilPers)	48,162	51,449	54,737	58,024	61,312	64,599	67,887	71,174	74,462	77,749
Cost to support new design										
Wholesale materiel cost	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
DLR cost	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost	88	88	88	88	88	88	88	88	88	88
Cost to support old (phasing out)										
Wholesale materiel cost										
DLR cost										
Replen buy cost										
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

$/ 1000 ROI(M) Calculations Year	1	2	3	4	5	6	7	8	9	10
					Solargizer Battery Maintenance System					
Denominator (Cost to undertake new program)										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development	0	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	2,970	2,970	0	0	0	0	0	0	0	0
Installs (H/W)	2,970	2,970	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Total Cost to Implement	2,970	2,970	0	0	0	0	0	0	0	0
Cum Cost to Implement	2,970	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940
Discounted Cost to Implement	2,970	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803
Numerator (Delta support cost resulting from new program)										
Cost to support existing program										
Wholesale materiel cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
DLR cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Cost to support new program										
Wholesale materiel cost	14,720	8,320	1,920	1,920	1,920	2,400	2,880	3,200	3,200	3,200
DLR cost	14,720	8,320	1,920	1,920	1,920	2,400	2,880	3,200	3,200	3,200
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	·0	0
Delta support cost (plus is good)										
Wholesale materiel cost	0	6,400	12,800	12,800	12,800	12,320	11,840	11,520	11,520	11,520
DLR cost	0	6,400	12,800	12,800	12,800	12,320	11,840	11,520	11,520	11,520
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Total Delta	0	6,400	12,800	12,800	12,800	12,320	11,840	11,520	11,520	11,520
Cumulative Delta	0	6,400	19,200	32,000	44,800	57,120	68,960	80,480	92,000	103,520
Discounted Cumulative Delta	0	6,105	17,754	28,867	39,468	49,202	58,126	66,409	74,311	81,849
ROI (Numerator/denominator)		1.1	3.2	5.4	7.5	9.6	11.6	13.5	15.5	17.4
Disounted ROI		1.1	3.1	5.0	6.8	8.5	10.0	11.4	12.8	14.1

		$/ 1000								
ROI(M) Calculations Year	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development	0	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)	0	0	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Total Cost to Implement	0	0	0	0	0	0	0	0	0	0
Cum Cost to Implement	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940
Discounted Cost to Implement	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803
Numerator (Delta support cost re										
Cost to support existing program										
Wholesale materiel cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
DLR cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Cost to support new program										
Wholesale materiel cost	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
DLR cost	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)										
Wholesale materiel cost	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520
DLR cost	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Total Delta	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520
Cumulative Delta	115,040	126,560	138,080	149,600	161,120	172,640	184,160	195,680	207,200	218,720
Discounted Cumulative Delta	89,040	95,901	102,445	108,688	114,644	120,326	125,746	130,917	135,850	140,555
ROI (Numerator/denominator)	19.4	21.3	23.2	25.2	27.1	29.1	31.0	32.9	34.9	36.8
Disounted ROI	15.3	16.5	17.7	18.7	19.8	20.7	21.7	22.6	23.4	24.2

$/ 1000 ROI(M) Calculations Year	1	2	3	4	5	6	7	8	9	10
Solargizer Battery Maintenance System										
Denominator (Cost to undertake new program)										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development	0	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	3,408	3,408	0	0	0	0	0	0	0	0
Installs (H/W)	2,970	2,970	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Installation (field labor)	438	438	0	0	0	0	0	0	0	0
Total Cost to Implement	2,970	2,970	0	0	0	0	0	0	0	0
Cum Cost to Implement	2,970	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940
Discounted Cost to Implement	2,970	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803
Numerator (Delta support cost resulting from new program)										
Cost to support existing program										
Wholesale materiel cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
DLR cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	350	350	350	350	350	350	350	350	350	350
Cost to support new program										
Wholesale materiel cost	14,720	8,320	1,920	1,920	1,920	2,400	2,880	3,200	3,200	3,200
DLR cost	14,720	8,320	1,920	1,920	1,920	2,400	2,880	3,200	3,200	3,200
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	403	228	53	53	53	66	79	88	88	88
Delta support cost										
Wholesale materiel cost	0	6,400	12,800	12,800	12,800	12,320	11,840	11,520	11,520	11,520
DLR cost	0	6,400	12,800	12,800	12,800	12,320	11,840	11,520	11,520	11,520
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	-53	123	298	298	298	284	271	263	263	263
Total Delta	-53	6,523	13,098	13,098	13,098	12,604	12,111	11,783	11,783	11,783
Cumulative Delta	-53	6,470	19,568	32,665	45,763	58,367	70,478	82,261	94,043	105,826
Discounted Cumulative Delta	-53	6,785	20,514	34,244	47,973	61,186	73,881	86,232	98,583	110,934
ROI (Numerator/denominator)		1.1	3.3	5.5	7.7	9.8	11.9	13.8	15.8	17.8
Discounted ROI		1.2	3.5	5.9	8.3	10.5	12.7	14.9	17.0	19.1

$/ 1000										
ROI(M) Calculations Year	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertak										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development	0	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)	0	0	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Installation (field labor)	0	0	0	0	0	0	0	0	0	0
Total Cost to Implement	0	0	0	0	0	0	0	0	0	0
Cum Cost to Implement	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940
Discounted Cost to Implement	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803	5,803
Numerator (Delta support cost										
Cost to support existing program										
Wholesale materiel cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
DLR cost	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	350	350	350	350	350	350	350	350	350	350
Cost to support new program										
Wholesale materiel cost	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
DLR cost	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	88	88	88	88	88	88	88	88	88	88
Delta support cost										
Wholesale materiel cost	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520
DLR cost	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520	11,520
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	263	263	263	263	263	263	263	263	263	263
Total Delta	11,783	11,783	11,783	11,783	11,783	11,783	11,783	11,783	11,783	11,783
Cumulative Delta	117,608	129,391	141,173	152,956	164,738	176,521	188,303	200,086	211,868	223,651
Discounted Cumulative Delta	123,285	135,636	147,987	160,338	172,689	185,040	197,391	209,742	222,093	234,444
ROI (Numerator/denominator)	19.8	21.8	23.8	25.8	27.7	29.7	31.7	33.7	35.7	37.7
Discounted ROI	21.2	23.4	25.5	27.6	29.8	31.9	34.0	36.1	38.3	40.4

A-10 Embedded Global Positioning System (GPS) Inertial (EGI) Navigation Unit

◆   Cover chart

◆   Return on investment (ROI) analysis

A-10 Embedded GPS Inertial Navigation Unit (EGI)

Discounted Savings

$ M

Year	

- 10yr ROI 16:1
- 20yr ROI 35:1

Cumulative Material Savings

Cumulative Investment

Reliability & Cost Comparison

Hours / $K

EGI 1,975 — New

LN-39 + Rec.3A 31.643 — Old

Old

EGI 11.9 — New

LN-39 185 — Old

Rec.3A 415 — Old

Mean Time Between Failures

Unit Cost

Data Source: SM-ALC LAFVM
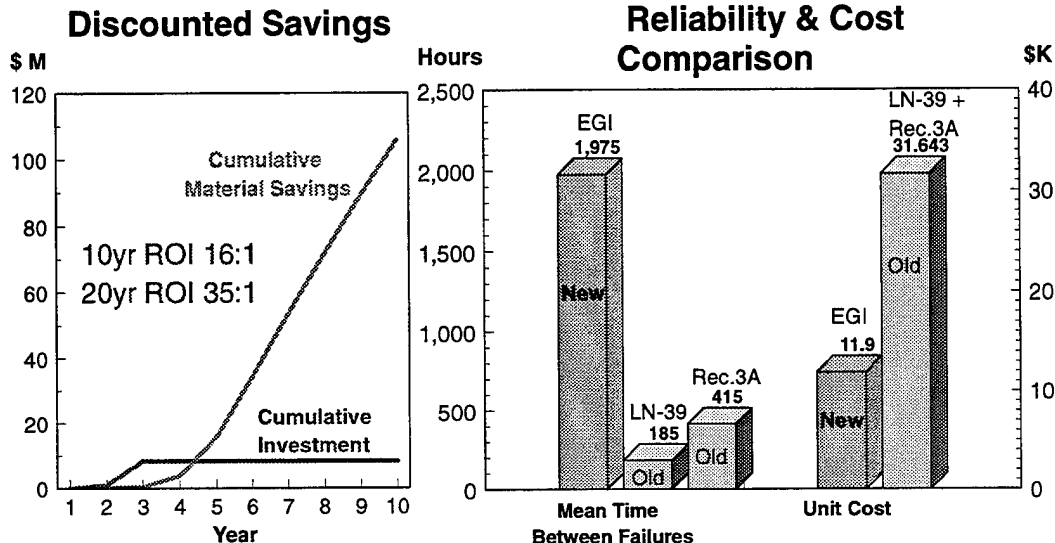
A-10 Embedded GPS Inertial Navigation Unit (EGI)

- **BACKGROUND:**
  - The A-10 (LN-39) inertial navigation unit (INU) must be upgraded to provide a Global Positioning System (GPS) capability to meet FAA requirements. The AF had decided to add a GPS receiver to the current LN-39 INU.

- **OBJECTIVE:**
  - This alternative compares savings from investing extra funds to replace the current LN-39 INU with a higher reliability ring laser gyro unit that has an embedded GPS (i.e. Embedded GPS INU [EGI]), instead of the baseline decision to add the A-3 GPS receiver to the existing LN-39 navigation unit.

- **SOURCE OF SAVINGS:**
  - Reduced failure rate and lower replacement cost of single integrated EGI navigation unit

Project Title:

A-10 Embedded GPS INU (EGI)
verses
AF Baseline with LN-39, GPS receiver A-3, AE-1 antenna control, and CRPA antenna

Source: Air Force, SA-ALC

ASSUMPTIONS:

1) Objective: Improve reliability by installing a single integrated navigation/GPS unit rather than adding a separate GPS unit to the current navigation set

2) All costs are are expressed in FY___94___ dollars

3) Dollars expressed in ___$1,000_ s throughout spreadsheet except this page

4) OMB CIR A-94 discount rate   4.8%   for investments 3/95-2/96 with maturity of 10-20 years

5) Data Sources: .
- a.   SRI GPS/RLG Technology Insertion Study for the A/OA-10 2-Level Maintenance LRU R&M Improvement Study Mar 24,94
- b.   A-10 program office SM-ALC/LAFVM data 1 Nov. 95 (see Alternative Program sheet, page 2)

6) All costs prior to the analysis are assumed to be sunk costs.

7) Implementation of each alternative will be assumed to start in the same year (existing system is mute point since GPS is required to meet FAA requirements)

8) Funding and schedule data for AF baseline program (add-on GPS)and EGI "Preferred Program" are derived from funding spread sheets shown on "Alternative program" sheet (page 2).
For cost comparison purposes the Baseline AF Solution cost (Alternative program page 2) is adjusted to a antenna configuration comparable to the EGI configuration.

9) A-10 fleet=___379___ aircraft (from 1 b. above)   Annual fleet hours =___184,122___   (from. 1 a. above)

10) Support data (from 5 a. above):

a. **Baseline AF solution** - LN-39 with GPS receiver 3A, AE-1 antenna control, and FRPA $/1

- Annual **field** level	LN-39= $1,174.210	GPS 3A	$51,910	TOTAL =	$1,229,630
maintenance cost:	AE-1= $3,510				
			Ave. TOTAL **field** cost/aircraft /year=		**$3,244**
- Annual **depot** repair cost	LN-39= $24,150,830	GPS 3A $3,272,940		TOTAL =	$27,610,290
	AE-2= $186,520				
			Ave. TOTAL **depot** cost/aircraft/year=		**$72,850**

b. **Embedded GPS IMU (EGI)** and FRPA antenna maintenance data : $/1

EGI MTBF is ___1,975___ hours   Average **field level** cost per aircraft per year= ___$32___
EGI MTBD is ___1,975___ hours   Average **depot level** cost per aircraft per year= __$5,809__

Notes:
- MTBM - Mean Time Between Maintenance at flight line   FRPA - Fixed Reception Pattern Antenna
- MTBD - Mean Time Between Demand on supply/depot   CRPA - Controlled Reception Pattern Antenna
- GPS - Global Positioning System   IMU - Inertial Measurement Unit

RESULTS:

MATERIAL ONLY   For investment of $ 8,918,000

1) ROI at 10 years after initiation	16	to 1	for cum. savings of	$143,836,347
2) ROI at 20 years after initiation	45	to 1	for cum. savings of	$397,921,527

DISCOUNTED MATERIAL ONLY   For investment of $ 6,721,597

3) ROI at 10 years after initiation	16	. to 1	for cum. savings of	$ 105,736,761
4) ROI at 20 years after initiation	35	to 1	for cum. savings of	$ 235,218,711

TOTAL SAVINGS   For investment of $ 8,918,000

5) ROI at 10 years after initiation	17	to 1	for cum. savings of	$ 150,728,615
6) ROI at 20 years after initiation	47	to 1	for cum. savings of	$ 416,988,905

DISCOUNTED TOTAL SAVINGS   For investment of $ 6,721,597

7) ROI at 10 years after initiation	16	to 1	for cum. savings of	$ 110,803,396
8) ROI at 20 years after initiation	37	to 1	for cum. savings of	$ 246,489,788

A-10 Embedded GPS INU (EGI)

$/ 1000s	FY96	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to undertake EGI	**14,200**	**26,700**	**41,800**	**17,700**	**6,500**	**2,300**	**0**	**0**	**0**	**0**
Non-recurring cost	800	3,100	1,200	1,100	300	0	0	0	0	0
Development	0									
H/W engineering	0	0	0	100	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	600	1,800	500	500	0	0	0	0	0	0
Support Equipment	0	300	0	0	0	0				
Spares/mods	0	0	100	100	300	0				
Data	0	700	300	0	0	0				
Other (ICS, etc.)	200	300	300	400	0	0				
Recurring cost	13,400	23,600	40,600	16,600	6,200	2,300	0	0	0	0
Installs (H/W)	13,300	23,500	40,500	13,200	0	0				
Installation (depot labor)	100	100	100	3,400	6,200	2,300				
Installation (field labor)	0	0								
Cost to implement AF Baseline	**28,858**	**25,716**	**19,758**	**17,780**	**7,732**	**438**	**0**	**0**	**0**	**0**
Non-recurring cost							0	0	0	0
Support Equipment		included below								
Spares/mods										
Recurring cost	28,858	25,716	19,758	17,780	7,732	438	0	0	0	0
Installs (H/W+LABOR)	28,858	25,716	19,758	17,780	7,732	438				
Delta support cost (EGI advantage over AF Baseline)										
Wholesale materiel cost	34	134	235	3,955	14,481	23,364	25,409	25,409	25,409	25,409
DLR cost	34	134	235	3,955	14,481	23,364	25,409	25,409	25,409	25,409
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	2	6	11	193	708	1,142	1,242	1,242	1,242	1,242
Total annual (without Milpers)	34	134	235	3,955	14,481	23,364	25,409	25,409	25,409	25,409
Total annual (with Milpers)	35	141	246	4,149	15,189	24,506	26,650	26,650	26,650	26,650
Cum (without Milpers)	34	168	402	4,358	18,839	42,202	67,611	93,019	118,428	143,836
Cum (with MilPers)	35	176	422	4,570	19,759	44,265	70,915	97,565	124,215	150,866
Cost to support EGI										
Wholesale materiel cost	3	12	20	343	1,255	2,025	2,202	2,202	2,202	2,202
DLR cost	3	12	20	343	1,255	2,025	2,202	2,202	2,202	2,202
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost	0	0	0	2	7	11	12	12	12	12
Cost to support AF Baseline										
Wholesale materiel cost	36	146	255	4,298	15,736	25,388	27,610	27,610	27,610	27,610
DLR cost	36	146	255	4,298	15,736	25,388	27,610	27,610	27,610	27,610
Replen buy cost										
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost	2	6	11	191	701	1,131	1,230	1,230	1,230	1,230
Fleet = 379 aircraft										
Ave. Acft modified	0.5	2	3.5	59	216	346.5	379	379	379	379

A-10 Embedded GPS INU (EGI)

$/ 1000s	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to undertake EGI	0	0	0	0	0	0	0	0	0	0
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development										
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Support Equipment										
Spares/mods										
Data										
Other (ICS, etc.)										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										
Cost to implement AF Baseline	0	0	0	0	0	0	0	0	0	0
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Support Equipment										
Spares/mods										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W+LABOR)										
Delta support cost (EGI advantage over AF Baseline)										
Wholesale materiel cost	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409
DLR cost	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242
Total annual (without Milpers)	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409
Total annual (with Milpers)	26,650	26,650	26,650	26,650	26,650	26,650	26,650	26,650	26,650	26,650
Cum (without Milpers)	169,245	194,653	220,062	245,470	270,879	296,287	321,696	347,104	372,513	397,922
Cum (with MilPers)	177,516	204,166	230,816	257,467	284,117	310,767	337,418	364,068	390,718	417,368
Cost to support EGI										
Wholesale materiel cost	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202
DLR cost	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost	12	12	12	12	12	12	12	12	12	12
Cost to support AF Baseline										
Wholesale materiel cost	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610
DLR cost	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610
Replen buy cost										
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230
Fleet =										
Ave. Acft modified	379	379	379	379	379	379	379	379	379	379

A-10 Embedded GPS INU (EGI)

$/ 1000s	FY96	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10

EGI Preferred Program Spreadsheet				$1000s		
	1996	1997	1998	1999	2000	2001
# Kit buys	0	111	204	61		
# Kit installs	1	2	1	110	204	61
PP $ Install Kits	0	2,200	4,200	1,300		
PP Kits Nonrecur	4,300	3,200	1,900	1,300		
PP Equip	9,000	18,100	34,400	10,600		
PP Change orders				100		
PP Data	0	700	300			
PP Support Eq.	0	300				
PP ICS	200	300	300	400		
PP Flight test	600	1,800	500	500		
PP Mod of spares			100	100	300	
PP Total install cost	100	100	100	3,400	6,200	2,300
TOTAL	14,200	26,700	41,800	17,700	6,500	2,300
CUMULATIVE						109,200

Baseline AF Program (LN-39, GPS receiver 3A, AE-1, CRPA)						
Adjustment to FRPA configuration for comparability with EGI						
	1995	1996	1997	1998	1999	2000
Baseline Total Program	28,900	25,800	19,800	22,400	16,300	3,000
Delete:						
CRPA	4	8	4	440	816	244
AE-1	25	50	25	2,750	5,100	1,525
AE1 installation cost	18	36	18	1,980	3,672	1,098
Add:						
FRPA	5	10	5	550	1020	305
Adjusted Baseline Prog.	28,858	25,716	19,758	17,780	7,732	438
CUMULATIVE						100,282

NOTE: Following data used in above ($ in thousands)		
CRPA unit cost	4	
AE-1 unit cost	25	
AE-1 install hours	200	(FRPA and CRPA installation
Labor rate	0.09	costs are comparable)
FRPA unit cost	5	

Note: Preferred program and baseline program data provided by SM-ALC/LAFVM Maj. Richard Feltham, EGI Program Manager

ROI(M) Calculations	$ 1000s				A-10 Embedded GPS INU (EGI)					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Denominator (Investment cost difference: EGI minus AF Adjusted Baseline)										
EGI cost to implement	14,200	26,700	41,800	17,700	6,500	2,300	0	0	0	0
Non-recurring	800	3,100	1,200	1,100	300	0	0	0	0	0
Recurring cost	13,400	23,600	40,600	16,600	6,200	2,300	0	0	0	0
Cumulative TOTAL	14,200	40,900	82,700	100,400	106,900	109,200				
AF Baseline cost to implement	28,858	25,716	19,758	17,780	7,732	438	0	0	0	0
Recurring/Non-recurring	28,858	25,716	19,758	17,780	7,732	438	0	0	0	0
Cumulative TOTAL	28,858	54,574	74,332	92,112	99,844	100,282	0	0	0	0
Delta Cost to Implement	(14,658)	984	22,042	(80)	(1,232)	1,862	0	0	0	0
Cumulative Delta Cost	(14,658)	(13,674)	8,368	8,288	7,056	8,918	8,918	8,918	8,918	8,918
Discount	1.000	0.9540	0.9101	0.8682	0.8282	0.7901	0.7537	0.7190	0.6859	0.6544
Discounted Delta Cost	(14,658)	939	20,060	(69)	(1,020)	1,471	0	0	0	
Cum. Discounted Delta Cost	(14,658)	(13,719)	6,340	6,271	5,250	6,722	6,722	6,722	6,722	6,722
Numerator (Delta support cost resulting from new program)										
Cost to support AF Baseline program										
Wholesale materiel cost	36	146	255	4,298	15,736	25,388	27,610	27,610	27,610	27,610
Cost to support EGI program										
Wholesale materiel cost	3	12	20	343	1,255	2,025	2,202	2,202	2,202	2,202
Delta support cost (plus is good)										
Wholesale materiel cost	34	134	235	3,955	14,481	23,364	25,409	25,409	25,409	25,409
Cumulative Delta Cost	34	168	402	4,358	18,839	42,202	67,611	93,019	118,428	143,836
Discounted Delta Cost	34	128	214	3,434	11,993	18,459	19,151	18,269	17,429	16,626
Cumulative Discounted Delta	34	161	375	3,809	15,802	34,262	53,413	71,682	89,110	105,737
RETURN ON INVESTMENT							1	2	3	4
ROI (Numerator/denominator)				0.5	2.7	4.7	7.6	10.4	13.3	16.1
Discounted ROI				0.6	3.0	5.1	7.9	10.7	13.3	15.7

$ 1000s				A-10 Embedded GPS INU (EGI)					
ROI(M) Calculations	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Denominator (Investment cost difference: EGI minus AF Adjusted Baseline)										
EGI cost to implement	0	0	0	0	0	0	0	0	0	0
Non-recurring	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Cumulative TOTAL										
AF Baseline cost to implement	0	0	0	0	0	0	0	0	0	0
Recurring/Non-recurring	0	0	0	0	0	0	0	0	0	0
Cumulative TOTAL	0	0	0	0	0	0	0	0	0	0
Delta Cost to Implement	0	0	0	0	0	0	0	0	0	0
Cumulative Delta Cost	8,918	8,918	8,918	8,918	8,918	8,918	8,918	8,918	8,918	8,918
Discount										
Discounted Delta Cost										
Cum. Discounted Delta Cost	6,722	6,722	6,722	6,722	6,722	6,722	6,722	6,722	6,722	6,722
	10	11	12	13	14	15	16	17	18	19
Numerator (Delta support cost resulting from new program)										
Cost to support AF Baseline program										
Wholesale materiel cost	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610
Cost to support EGI program										
Wholesale materiel cost	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202
Delta support cost (plus is good)										
Wholesale materiel cost	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409
Cumulative Delta Cost	169,245	194,653	220,062	245,470	270,879	296,287	321,696	347,104	372,513	397,922
Discounted Delta Cost	15,861	15,131	14,434	13,770	13,136	12,532	11,955	11,405	10,880	10,379
Cumulative Discounted Delta	121,598	136,729	151,163	164,933	178,069	190,601	202,556	213,960	224,840	235,219
RETURN ON INVESTMENT	5	6	7	8	9	10	11	12	13	14
ROI (Numerator/denominator)	19.0	21.8	24.7	27.5	30.4	33.2	36.1	38.9	41.8	44.6
Discounted ROI	18.1	20.3	22.5	24.5	26.5	28.4	30.1	31.8	33.5	35.0

A-10 Embedded GPS INU (EGI)

$ 1000s	1	2	3	4	5	6	7	8	9	10
ROI(T) Calculations										
Denominator (Cost to undertake new program)										
EGI Cost to implement	**14,200**	**26,700**	**41,800**	**17,700**	**6,500**	**2,300**	**0**	**0**	**0**	**0**
Non-recurring cost	800	3,100	1,200	1,100	300	0	0	0	0	0
Recurring cost	13,400	23,600	40,600	16,600	6,200	2,300	0	0	0	0
AF Baseline cost to implement	**28,858**	**25,716**	**19,758**	**17,780**	**7,732**	**438**	**0**	**0**	**0**	**0**
Non-recurring cost	28,858	25,716	19,758	17,780	7,732	438	0	0	0	0
Recurring cost	included in non-recurring									
Cumulative cost to undertake	(14,658)	(13,674)	8,368	8,288	7,056	8,918	8,918	8,918	8,918	8,918
Discounted Cum. cost	(14,658)	(13,719)	6,340	6,271	5,250	6,722	6,722	6,722	6,722	6,722
Numerator (Delta support cost resulting from new program)										
Cost to support existing program										
Wholesale materiel cost	36	146	255	4,298	15,736	25,388	27,610	27,610	27,610	27,610
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	2	6	11	191	701	1,131	1,230	1,230	1,230	1,230
Cost to support new program										
Wholesale materiel cost	3	12	20	343	1,255	2,025	2,202	2,202	2,202	2,202
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	2	7	11	12	12	12	12
Delta support cost										
Wholesale materiel cost	34	134	235	3,955	14,481	23,364	25,409	25,409	25,409	25,409
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	2	6	11	190	694	1,120	1,218	1,218	1,218	1,218
Cumulative delta support cost	35	176	422	4,566	19,741	44,224	70,851	97,477	124,103	150,729
Discounted Cum. delta	35	169	393	3,991	16,559	35,903	55,972	75,117	93,380	110,803

RETURN ON INVESTMENT

	1	2	3	4	5	6	7	8	9	10
ROI (Numerator/denominator)				0.6	2.8	5.0	7.9	10.9	13.9	16.9
Discounted ROI				0.6	3.2	5.3	8.3	11.2	13.9	16.5

A-10 Embedded GPS INU (EGI)

ROI(T) Calculations	$ 1000s	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
EGI Cost to implement		0	0	0	0	0	0	0	0	0	0
Non-recurring cost		0									
Recurring cost		0									
AF Baseline cost to implement		0	0	0	0	0	0	0	0	0	0
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Recurring cost											
Cumulative cost to undertake		8,918	8,918	8,918	8,918	8,918	8,918	8,918	8,918	8,918	8,918
Discounted Cum. cost		6,722	6,722	6,722	6,722	6,722	6,722	6,722	6,722	6,722	6,722
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610	27,610
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230	1,230
Cost to support new program											
Wholesale materiel cost		2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202	2,202
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		12	12	12	12	12	12	12	12	12	12
Delta support cost											
Wholesale materiel cost		25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409	25,409
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		1,218	1,218	1,218	1,218	1,218	1,218	1,218	1,218	1,218	1,218
Cumulative delta support cost		177,355	203,981	230,607	257,233	283,859	310,485	337,111	363,737	390,363	416,989
Discounted Cum. delta		127,424	143,280	158,407	172,836	186,602	199,734	212,262	224,213	235,614	246,490

RETURN ON INVESTMENT

	$ 1000s	11	12	13	14	15	16	17	18	19	20
ROI (Numerator/denominator)		19.9	22.9	25.9	28.8	31.8	34.8	37.8	40.8	43.8	46.8
Discounted ROI		19.0	21.3	23.6	25.7	27.8	29.7	31.6	33.4	35.1	36.7

MLRS Fire Control Panel Troop Proficiency Trainer (FCP-TPT)

◆   Cover chart

◆   Return on investment (ROI) analysis
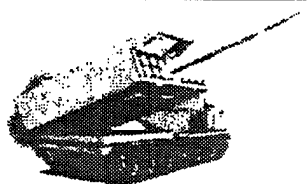
MLRS Fire Control Panel Troop Proficiency Trainer (FCP-TPT)

Discounted Savings

$ M

Cumulative Material Savings

10yr ROI 11:1

$ 6m Cumulative Investment

Year
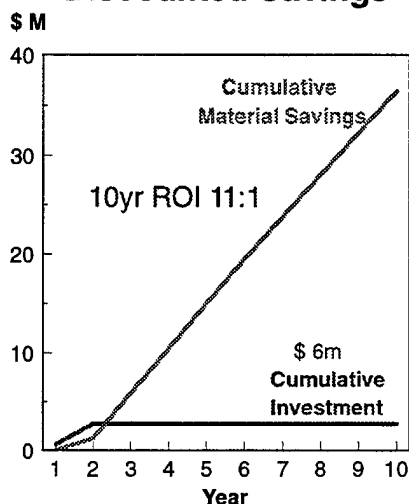
Annual Operating Cost

$M   (yr 5)

55

49

FCP-TPT   MLRS
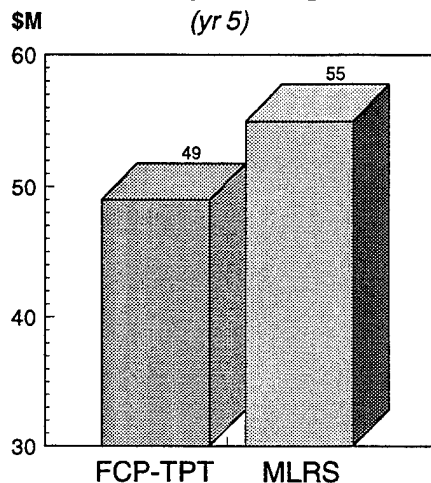
Data Source: Army MICOM, MLRS Project Office

MLRS Fire Control Panel Troop Proficiency Trainer (FCP-TPT)

- **BACKGROUND:**
  - Currently MLRS training, including dry firing, is accomplished with functional MLRS launchers.
  - A prototype, ruggedized classroom trainer (with GPS added and mounted on a HMMWV) to be used for dry fire training in place of the MLRS has been developed and will undergoing testing at V Corp (Germany).
- **OBJECTIVE:**
  - Field-ruggedized trainers (FCP-TPT) that would meet all dry fire training requirements without subjecting tactical MLRSs to associated wear and tear
- **SOURCE OF SAVINGS:**
  - Reduced failures of MLRSs and the resulting reduction of material consumption

Project Title: **MLRS Fire Control Panel Troop Proficiency Trainer (FCP-PTP)**
Source: Army MICOM MLRS Project Office Keil Bishop, (205) 842-7153

ASSUMPTIONS:

1) Objective: Reduce failures of MLRSs during training by using a simulator for dry firing
instead of an actual Multiple Lanuch Rocket System
2) All costs are are expressed in FY _____ dollars
3) Dollars expressed in ___$1,000_ s throughout spreadsheet
4) OMB CIR A-94 discount rate = __4.8%__ for investments 3/95-2/96 with maturity of 10-20 years
5) Project would involve ___513___ launchers including active and National Guard
6) Economic life of MLRS and FCP-TPT are both 10 years
7) __90%___ of total FCP-TPT are assumed to be installed the first year
8) Economic life of training system is estimated at 10 years, thus, replacement included at 11th year
9) Data provided only included intermediate and depot maintenance

RESULTS:

MATERIAL ONLY

1) ROI M at 10 years	**14**	to 1	*For an investment of*	$	**3,335,094**
			Cumulative saving of	$	46,972,847

DISCOUNTED, MATERIALS ONLY

2) ROI M *d* at 10 years	**11**	to 1	*For discounted investment of*	$	3,209,158
			Cumulative saving of	$	36,432,032

TOTAL SAVINGS   NO FIELD MAINTENANCE INCLUDED IN DATA

3) ROI T at 10 years	**14**	to 1	*For an investment of*	$	**3,335,094**
			Cumulative saving of	$	46,972,847

DISCOUNTED TOTAL SAVINGS

4) ROI T *d* at 10 years	**11**	to 1	*For discounted investment of*	$	3,209,158
			Cumulative saving of	$	36,432,032

MLRS Fire Control Panel Troop Proficiency Trainer (FCP-PTP)

Cost to support existing program	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
					$/ 1000					
Wholesale materiel cost	47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
DLR cost	47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cum w/o Milpers)	47,514	96,722	148,157	201,131	255,698	311,899	369,787	429,410	490,824	554,081
Cum (with Milpers)	47,514	96,722	148,157	201,131	255,698	311,899	369,787	429,410	490,824	554,081
Current Operating costs	47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257

MLRS Fire Control Panel Troop Proficiency Trainer (FCP-PTP)

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to undertake new program										
Non-recurring cost	599	0	0	0	0	0	0	0	0	0
Development	599									
Integration										
H/W engineering										
S/W engineering										
Integration assets										
Regression T&E										
Data										
Recurring cost	0	2,736	0	0	0	0	0	0	0	0
Installs (H/W)		2,736								
Installation (depot labor)										
Installation (field labor)										
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
DLR cost	47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
Total annual (with Milpers)	47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
Cum (without Milpers)	47,514	95,429	141,726	189,410	238,526	289,114	341,221	394,889	450,169	507,109
Cum (with MilPers)	47,514	95,429	141,726	189,410	238,526	289,114	341,221	394,889	450,169	507,109
Cost to support new design										
Wholesale materiel cost	47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
DLR cost	47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cost to support old (phasing out) design										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost						0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

NOTE: The operating data below accounts for the transition period and data did not allow breakout for phasing.

Project Funding										
R&D	599									
Installation H/W, labor		2,736								
Operating cost	47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939

ROI(M) Calculations

MLRS Fire Control Panel Troop Proficiency Trainer (FCP-PTP)

Material Savings	YEAR / Time	1	2	3	4 $/ 1000	5	6	7	8	9	10
Denominator (Cost to undertake new program)											
Non-recurring cost		599	0	0	0	0	0	0	0	0	0
Development		599	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	2,736	0	0	0	0	0	0	0	0
Installs (H/W)		0	2,736	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Total Cost to Implement		599	2,736	0	0	0	0	0	0	0	0
Cum Cost to Implement		599	3,335	3,335	3,335	3,335	3,335	3,335	3,335	3,335	3,335
Discounted Cost to Implement		599	3,209	3,209	3,209	3,209	3,209	3,209	3,209	3,209	3,209
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
DLR cost		47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
DLR cost		47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)											
Wholesale materiel cost		0	1,293	5,137	5,291	5,450	5,613	5,782	5,955	6,134	6,318
DLR cost		0	1,293	5,137	5,291	5,450	5,613	5,782	5,955	6,134	6,318
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Total Delta		0	1,293	5,137	5,291	5,450	5,613	5,782	5,955	6,134	6,318
Cumulative Delta		0	1,293	6,430	11,721	17,171	22,784	28,566	34,521	40,655	46,973
Discounted Cumulative Delta		0	1,234	5,909	10,502	15,016	19,451	23,809	28,090	32,298	36,432
Return on Investment											
ROI (Numerator/denominator)			0.4	1.9	3.5	5.1	6.8	8.6	10.4	12.2	14.1
DISCOUNTED ROI			0.4	1.8	3.3	4.7	6.1	7.4	8.8	10.1	11.4

ROI(T) Calculations

MLRS Fire Control Panel Troop Proficiency Trainer (FCP-PTP)

Total Savings YEAR	Time 1	2	3	4	5	6	7	8	9	10
					$/ 1000					
Denominator (Cost to undertake new program)										
Non-recurring cost	599	0	0	0	0	0	0	0	0	0
Development	599	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	2,736	0	0	0	0	0	0	0	0
Installs (H/W)	0	2,736	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Installation (field labor)	0	0	0	0	0	0	0	0	0	0
Total cost to implement	599	2,736	0	0	0	0	0	0	0	0
Cumulative total cost to implement	599	3,335	3,335	3,335	3,335	3,335	3,335	3,335	3,335	3,335
Discounted cumulative total cost	599	3,209	3,209	3,209	3,209	3,209	3,209	3,209	3,209	3,209
Numerator (Delta support cost resulting from new program)										
Cost to support existing program										
Wholesale materiel cost	47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
DLR cost	47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Cost to support new program										
Wholesale materiel cost	47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
DLR cost	47,514	47,915	46,297	47,683	49,117	50,588	52,107	53,668	55,280	56,939
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Delta support cost										
Wholesale materiel cost	0	1,293	5,137	5,291	5,450	5,613	5,782	5,955	6,134	6,318
DLR cost	0	1,293	5,137	5,291	5,450	5,613	5,782	5,955	6,134	6,318
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	47,514	49,209	51,434	52,974	54,567	56,201	57,888	59,623	61,414	63,257
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total delta cost to support	0	1,293	5,137	5,291	5,450	5,613	5,782	5,955	6,134	6,318
Cumulative total delta cost to support	0	1,293	6,430	11,721	17,171	22,784	28,566	34,521	40,655	46,973
Discounted cumulative delta cost	0	1,234	5,909	10,502	15,016	19,451	23,809	28,090	32,298	36,432
Return on Investment										
ROI (Numerator/denominator)	0.0	0.4	1.9	3.5	5.1	6.8	8.6	10.4	12.2	14.1
Discounted ROI	0.0	0.4	1.8	3.3	4.7	6.1	7.4	8.8	10.1	11.4

AH-64 Hydraulic Reservoir Pressurization

- ◆ Cover chart

- ◆ Return on investment (ROI) analysis
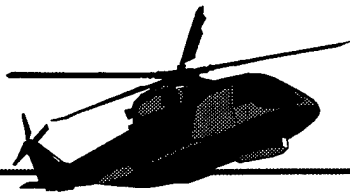
AH-64 Hydraulic Reservoir Pressurization

Discounted Savings

$ M

10yr ROI 6:1
20yr ROI 26:1

Cumulative Material Savings

Cumulative Investment

Year
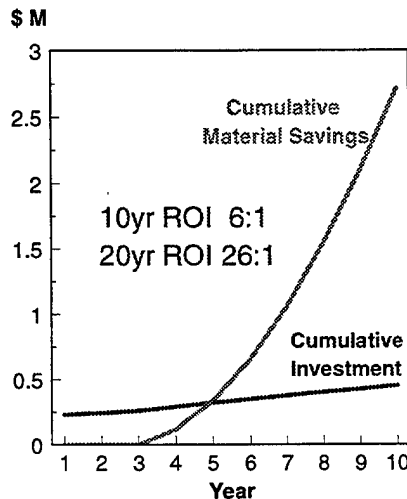
Annual Savings, 10th yr

$ K
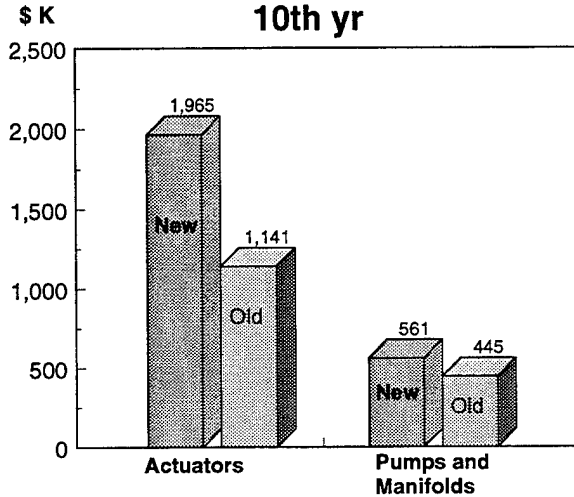
Data Source: ATCOM PEO-AV

AH-64 Hydraulic Reservoir Pressurization

- **BACKGROUND:**
  - The Apache hydraulic system is pressurized during nonoperation to prevent cavitation of hydraulic pump during start-up. After extended nonoperation the pressure is lost, and the hydraulic pump and manifold incur excessive wear during start-up. Also, pressurization during non operation results in hydraulic actuator leakage and replacement.
- **OBJECTIVE:**
  - Modify hydraulic system to provide pressurization during start-up and to release pressure during non-operation
  - Accomplish during Apache Longbow remanufacture to reduce investment cost
- **SOURCE OF SAVINGS:**
  - Improved reliability and reduced material consumption

Project Title: **AH-64 Pressurization of Hydraulic Reservoirs**
During Aircraft Startup and Remove Reservoir Check Valves
Source: Army, ATCOM, PEO-AV

ASSUMPTIONS:

1) Objective: Improve reliability and reduce material repair cost of:
   1) Hydraulic pumps and manifolds subject to pump cavitation and overheating during startup;
   2) Actuators subject to static leakage induced by pressurized hydraulic system during periods of non-operation.
2) All costs are expressed in FY __95__ dollars
3) Dollars expressed in __$1,000__ s throughout spreadsheet <u>except</u> this page
4) OMB CIR A-94 discount rate = __4.8%__ for investments 3/95-2/96 with maturity of 10-20 years
5) Modification will be done during re-manufacture of the AH-64A to Apache Longbow configuration.
   Thus, analysis compares re-manufacture without and with the proposed change. (i.e. Only costs during re-manufacture and post deployment are considered.)
6) Data from McDonnell Douglas VECP Serial No. A013-838, February 16, 95

	Current Config.			Proposed Config.				
	Annual Demand	Annual Demand Rate per Acft	Improve ment	Annual Demand Rate per Acft.	Unit $	Depot Labor Hrs (incl. MOC)	Repair $	Transport ation $
Hydraulic axial pump	143	0.181	30%	0.127	5,432	5.5	2,200	10
Manifold	68	0.086	10%	0.078	18,488	3.5	5,100	100
Lateral/Col. Actuator	169	0.214	45%	0.118	51,620	12	7,050	100
Longitudinal Actuator	76	0.096	50%	0.048	66,493	12	6,850	100
Directional Actuator	65	0.082	25%	0.062	60,526	15	6,700	100

Scrap rate = 0.01
Depot labor rate = $ 185
Aircraft Fleet = 788
Production rate is assumed to be 72 aircraft per year at peak production with startup that delivers 72 aircraft at the end of the 3rd year.
Installation kit, materials and labor costs $ 500 per aircraft (Analysis assumes 50% labor and 50% materials)

RESULTS:

MATERIAL ONLY

1) ROI M at 10 years	7.3	to 1	For an investment of $	513,000
			Cumulative saving of $	3,759,147
2) ROI M at 20 years	41	to 1	For an investment of $	619,000
			Cumulative saving of $	25,389,617

DISCOUNTED, MATERIALS ONLY

3) ROI M d at 10 years	6.0	to 1	For discounted investment of $	449,523
			Cumulative saving of $	2,712,088
4) ROI M d at 20 years	26	to 1	For discounted investment of $	512,749
			Cumulative saving of $	13,149,488

TOTAL SAVINGS   No field labor savings reported

5) ROI T at 10 years	7.3	to 1	For an investment of $	513,000
			Cumulative saving of $	3,759,147
6) ROI T at 20 years	41.0	to 1	For an investment of $	619,000
			Cumulative saving of $	25,389,617

DISCOUNTED TOTAL SAVINGS

7) ROI T d at 10 years	6.0	to 1	For discounted investment of $	449,523
			Cumulative saving of $	2,712,088
8) ROI T d at 20 years	25.6	to 1	For discounted investment of $	512,749
			Cumulative saving of $	13,149,488

AH-64 Pressurization of Hydraulic Reservoirs

$/ 1000 **Cost to support existing program**	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
				$/ 1000						
Wholesale materiel cost	0	0	0	361	722	1,083	1,444	1,805	2,166	2,527
DLR cost	0	0	0	361	722	1,083	1,444	1,805	2,166	2,527
Replen buy cost										
Reparables										
Consumables										
Depot-level maint. cost										
MILPERS cost										
Cum w/o MILPERS)	0	0	0	361	1,083	2,166	3,609	5,414	7,580	10,106
Cum (with MILPERS)	0	0	0	361	1,083	2,166	3,609	5,414	7,580	10,106
EXISTING PROGRAM										
Delivered Aircraft	0	0	0	72	144	216	288	360	432	504
Hydraulic axial pump										
Failures	0	0	0	13	26	39	52	65	78	91
Scrap/Washout replacement	0	0	0	1	1	2	3	4	4	5
Repair/overhaul	0	0	0	29	57	86	115	144	172	201
Material/repair subtotal	0	0	0	29	59	88	118	147	177	206
Repair labor cost	0	0	0	13	26	39	53	66	79	92
Transportation	0	0	0	0	0	0	1	1	1	1
TOTAL	0	0	0	43	85	128	171	214	256	299
Primary Manifold										
Failures	0	0	0	6	12	19	25	31	37	43
Scrap/Washout replacement	0	0	0	1	2	3	5	6	7	8
Repair/overhaul	0	0	0	32	63	95	127	158	190	222
Material/repair subtotal	0	0	0	33	66	99	131	164	197	230
Repair labor cost	0	0	0	4	8	12	16	20	24	28
Transportation	0	0	0	1	1	2	2	3	4	4
TOTAL	0	0	0	37	75	112	150	187	225	262
Lateral/Collective Actuator										
Failures	0	0	0	15	31	46	62	77	93	108
Scrap/Washout replacement	0	0	0	8	16	24	32	40	48	56
Repair/overhaul	0	0	0	109	218	327	435	544	653	762
Material/repair subtotal	0	0	0	117	234	351	467	584	701	818
Repair labor cost	0	0	0	34	68	102	136	170	204	238
Transportation	0	0	0	2	3	5	6	8	9	11
TOTAL	0	0	0	152	305	457	609	762	914	1,066
Longitudinal Actuator										
Failures	0	0	0	7	14	21	28	35	42	49
Scrap/Washout replacement	0	0	0	5	9	14	18	23	28	32
Repair/overhaul	0	0	0	48	95	143	190	238	285	333
Material/repair subtotal	0	0	0	52	104	157	209	261	313	365
Repair labor cost	0	0	0	15	31	46	61	76	92	107
Transportation	0	0	0	1	1	2	3	3	4	5
TOTAL	0	0	0	68	136	204	273	341	409	477
Directional Actuator										
Failures	0	0	0	6	12	18	24	30	36	42
Scrap/Washout replacement	0	0	0	4	7	11	14	18	22	25
Repair/overhaul	0	0	0	40	80	119	159	199	239	279
Material/repair subtotal	0	0	0	43	87	130	174	217	260	304
Repair labor cost	0	0	0	16	33	49	65	82	98	114
Transportation	0	0	0	1	1	2	2	3	4	4
TOTAL	0	0	0	60	121	181	241	301	362	422
Summary										
Repair costs (mtl.)	0	0	0	275	549	824	1,099	1,373	1,648	1,923
MMH (labor)	0	0	0	83	165	248	331	413	496	579
Transportation	0	0	0	4	7	11	14	18	22	25
Total = DLR cost	0	0	0	361	722	1,083	1,444	1,805	2,166	2,527

AH-64 Pressurization of Hydraulic Reservoirs

$/ 1000 **Cost to support existing program**	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Wholesale materiel cost	2,888	3,248	3,609	3,970	4,331	4,692	5,053	5,414	5,775	6,136
DLR cost	2,888	3,248	3,609	3,970	4,331	4,692	5,053	5,414	5,775	6,136
Replen buy cost										
Reparables										
Consumables										
Depot-level maint. cost										
MILPERS cost										
Cum w/o MILPERS)	12,994	16,242	19,852	23,822	28,153	32,846	37,899	43,313	49,088	55,224
Cum (with MILPERS)	12,994	16,242	19,852	23,822	28,153	32,846	37,899	43,313	49,088	55,224
EXISTING PROGRAM										
Delivered Aircraft	576	648	720	792	864	936	1008	1080	1152	1224
Hydraulic axial pump										
Failures	105	118	131	144	157	170	183	196	209	222
Scrap/Washout replacement	6	6	7	8	9	9	10	11	11	12
Repair/overhaul	230	259	287	316	345	374	402	431	460	489
Material/repair subtotal	236	265	295	324	353	383	412	442	471	501
Repair labor cost	105	118	132	145	158	171	184	197	211	224
Transportation	1	1	1	1	2	2	2	2	2	2
TOTAL	342	385	427	470	513	556	598	641	684	727
Primary Manifold										
Failures	50	56	62	68	75	81	87	93	99	106
Scrap/Washout replacement	9	10	11	13	14	15	16	17	18	20
Repair/overhaul	253	285	317	349	380	412	444	475	507	539
Material/repair subtotal	263	296	328	361	394	427	460	493	525	558
Repair labor cost	32	36	40	44	48	52	56	60	64	68
Transportation	5	6	6	7	7	8	9	9	10	11
TOTAL	300	337	374	412	449	487	524	562	599	636
Lateral/Collective Actuator										
Failures	124	139	154	170	185	201	216	232	247	263
Scrap/Washout replacement	64	72	80	88	96	104	112	120	128	136
Repair/overhaul	871	980	1,089	1,197	1,306	1,415	1,524	1,633	1,742	1,851
Material/repair subtotal	935	1,052	1,168	1,285	1,402	1,519	1,636	1,753	1,869	1,986
Repair labor cost	272	305	339	373	407	441	475	509	543	577
Transportation	12	14	15	17	19	20	22	23	25	26
TOTAL	1,219	1,371	1,523	1,675	1,828	1,980	2,132	2,285	2,437	2,589
Longitudinal Actuator										
Failures	56	62	69	76	83	90	97	104	111	118
Scrap/Washout replacement	37	42	46	51	55	60	65	69	74	78
Repair/overhaul	381	428	476	523	571	618	666	714	761	809
Material/repair subtotal	417	470	522	574	626	678	731	783	835	887
Repair labor cost	122	137	153	168	183	198	214	229	244	259
Transportation	6	6	7	8	8	9	10	10	11	12
TOTAL	545	613	681	750	818	886	954	1,022	1,090	1,158
Directional Actuator										
Failures	48	53	59	65	71	77	83	89	95	101
Scrap/Washout replacement	29	32	36	40	43	47	50	54	58	61
Repair/overhaul	318	358	398	438	478	517	557	597	637	676
Material/repair subtotal	347	390	434	477	521	564	607	651	694	738
Repair labor cost	131	147	163	179	196	212	228	245	261	277
Transportation	5	5	6	7	7	8	8	9	10	10
TOTAL	482	543	603	663	724	784	844	904	965	1,025
Summary										
Repair costs (mtl.)	2,198	2,472	2,747	3,022	3,296	3,571	3,846	4,120	4,395	4,670
MMH (labor)	661	744	827	909	992	1,075	1,157	1,240	1,323	1,405
Transportation	29	32	36	39	43	47	50	54	57	61
Total = DLR cost	2,888	3,248	3,609	3,970	4,331	4,692	5,053	5,414	5,775	6,136

AH-64 Pressurization of Hydraulic Reservoirs

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to undertake new program										
Non-recurring cost	225	0	0	0	0	0	0	0	0	0
Development	225									
Integration										
H/W engineering										
S/W engineering										
Integration assets										
Regression T&E										
Data										
Recurring cost	6	10	20	36	36	36	36	36	36	36
Installs (H/W)	3	5	10	18	18	18	18	18	18	18
Installation (depot labor)	3	5	10	18	18	18	18	18	18	18
Installation (field labor)										
Kit installs	12	20	40	72	72	72	72	72	72	72
Cost to support new program										
(sum of phasing in & phasing										
out designs)										
Wholesale materiel cost	0	0	0	227	453	680	907	1,133	1,360	1,587
DLR cost	0	0	0	227	453	680	907	1,133	1,360	1,587
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	0	0	0	227	453	680	907	1,133	1,360	1,587
Total annual (with Milpers)	0	0	0	227	453	680	907	1,133	1,360	1,587
Cum (without Milpers)	0	0	0	227	680	1,360	2,267	3,400	4,760	6,347
Cum (with MilPers)	0	0	0	227	680	1,360	2,267	3,400	4,760	6,347
Cost to support new design										
Wholesale materiel cost	0	0	0	227	453	680	907	1,133	1,360	1,587
DLR cost	0	0	0	227	453	680	907	1,133	1,360	1,587
Replen buy cost										
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cost to support old (phasing										
out) design		{Re-manufacturing of system THUS, NO OLD SYSTEM COSTS}								
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

AH-64 Pressurization of Hydraulic Reservoirs

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
PROPOSED PROGRAM										
Fielded New Config. #s	0	0	0	72	144	216	288	360	432	504
Hydraulic axial pump										
Failures	0	0	0	9	18	27	37	46	55	64
Scrap/Washout replacement	0	0	0	0	1	1	2	2	3	3
Repair/overhaul	0	0	0	20	40	60	80	101	121	141
Material/repair subtotal	0	0	0	21	41	62	82	103	124	144
Repair labor cost	0	0	0	9	18	28	37	46	55	64
Transportation	0	0	0	0	0	0	0	0	1	1
TOTAL	0	0	0	30	60	90	120	150	180	209
Primary Manifold										
Failures	0	0	0	6	11	17	22	28	34	39
Scrap/Washout replacement	0	0	0	1	2	3	4	5	6	7
Repair/overhaul	0	0	0	29	57	86	114	143	171	200
Material/repair subtotal	0	0	0	30	59	89	118	148	177	207
Repair labor cost	0	0	0	4	7	11	14	18	22	25
Transportation	0	0	0	1	1	2	2	3	3	4
TOTAL	0	0	0	34	67	101	135	168	202	236
Lateral/Collective Actuator										
Failures	0	0	0	8	17	25	34	42	51	59
Scrap/Washout replacement	0	0	0	4	9	13	18	22	26	31
Repair/overhaul	0	0	0	60	120	180	239	299	359	419
Material/repair subtotal	0	0	0	64	129	193	257	321	386	450
Repair labor cost	0	0	0	19	37	56	75	93	112	131
Transportation	0	0	0	1	2	3	3	4	5	6
TOTAL	0	0	0	84	168	251	335	419	503	586
Longitudinal Actuator										
Failures	0	0	0	3	7	10	14	17	21	24
Scrap/Washout replacement	0	0	0	2	5	7	9	12	14	16
Repair/overhaul	0	0	0	24	48	71	95	119	143	166
Material/repair subtotal	0	0	0	26	52	78	104	130	157	183
Repair labor cost	0	0	0	8	15	23	31	38	46	53
Transportation	0	0	0	0	1	1	1	2	2	2
TOTAL	0	0	0	34	68	102	136	170	204	238
Directional Actuator										
Failures	0	0	0	4	9	13	18	22	27	31
Scrap/Washout replacement	0	0	0	3	5	8	11	13	16	19
Repair/overhaul	0	0	0	30	60	90	119	149	179	209
Material/repair subtotal	0	0	0	33	65	98	130	163	195	228
Repair labor cost	0	0	0	12	24	37	49	61	73	86
Transportation	0	0	0	0	1	1	2	2	3	3
TOTAL	0	0	0	45	90	136	181	226	271	317
Phase-in Summary										
Repair costs (mtl.)	0	0	0	173	346	519	692	865	1,038	1,211
MMH (labor)	0	0	0	51	103	154	205	257	308	359
Transportation	0	0	0	2	5	7	9	11	14	16
Total = DLR cost	0	0	0	227	453	680	907	1,133	1,360	1,587

AH-64 Pressurization of Hydraulic Reservoirs

$/ 1000	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to undertake new program										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development										
Integration										
H/W engineering										
S/W engineering										
Integration assets										
Regression T&E										
Data										
Recurring cost	36	36	34	0	0	0	0	0	0	0
Installs (H/W)	18	18	17	0	0	0	0	0	0	0
Installation (depot labor)	18	18	17	0	0	0	0	0	0	0
Installation (field labor)										
Kit installs	72	72	68	0	0	0	0	0	0	0
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
DLR cost	1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
Total annual (with Milpers)	1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
Cum (without Milpers)	8,161	10,201	12,468	14,949	17,430	19,911	22,392	24,873	27,353	29,834
Cum (with MilPers)	8,161	10,201	12,468	14,949	17,430	19,911	22,392	24,873	27,353	29,834
Cost to support new design										
Wholesale materiel cost	1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
DLR cost	1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
Replen buy cost										
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cost to support old (phasing out) design										
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost	0	0	0	0	0	0	0	0	0	0
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

AH-64 Pressurization of Hydraulic Reservoirs

$/ 1000	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
PROPOSED PROGRAM										
Fielded New Config. #s	576	648	720	788	788	788	788	788	788	788
Hydraulic axial pump										
Failures	73	82	91	100	100	100	100	100	100	100
Scrap/Washout replacement	4	4	5	5	5	5	5	5	5	5
Repair/overhaul	161	181	201	220	220	220	220	220	220	220
Material/repair subtotal	165	186	206	226	226	226	226	226	226	226
Repair labor cost	74	83	92	101	101	101	101	101	101	101
Transportation	1	1	1	1	1	1	1	1	1	1
TOTAL	239	269	299	327	327	327	327	327	327	327
Primary Manifold										
Failures	45	50	56	61	61	61	61	61	61	61
Scrap/Washout replacement	8	9	10	11	11	11	11	11	11	11
Repair/overhaul	228	257	285	312	312	312	312	312	312	312
Material/repair subtotal	236	266	296	323	323	323	323	323	323	323
Repair labor cost	29	32	36	39	39	39	39	39	39	39
Transportation	4	5	6	6	6	6	6	6	6	6
TOTAL	270	303	337	369	369	369	369	369	369	369
Lateral/Collective Actuator										
Failures	68	76	85	93	93	93	93	93	93	93
Scrap/Washout replacement	35	39	44	48	48	48	48	48	48	48
Repair/overhaul	479	539	599	655	655	655	655	655	655	655
Material/repair subtotal	514	578	643	703	703	703	703	703	703	703
Repair labor cost	149	168	187	204	204	204	204	204	204	204
Transportation	7	8	8	9	9	9	9	9	9	9
TOTAL	670	754	838	917	917	917	917	917	917	917
Longitudinal Actuator										
Failures	28	31	35	38	38	38	38	38	38	38
Scrap/Washout replacement	18	21	23	25	25	25	25	25	25	25
Repair/overhaul	190	214	238	260	260	260	260	260	260	260
Material/repair subtotal	209	235	261	286	286	286	286	286	286	286
Repair labor cost	61	69	76	84	84	84	84	84	84	84
Transportation	3	3	3	4	4	4	4	4	4	4
TOTAL	273	307	341	373	373	373	373	373	373	373
Directional Actuator										
Failures	36	40	45	49	49	49	49	49	49	49
Scrap/Washout replacement	22	24	27	30	30	30	30	30	30	30
Repair/overhaul	239	269	298	327	327	327	327	327	327	327
Material/repair subtotal	260	293	325	356	356	356	356	356	356	356
Repair labor cost	98	110	122	134	134	134	134	134	134	134
Transportation	4	4	4	5	5	5	5	5	5	5
TOTAL	362	407	452	495	495	495	495	495	495	495
Phase-in Summary										
Repair costs (mtl.)	1,384	1,558	1,731	1,894	1,894	1,894	1,894	1,894	1,894	1,894
MMH (labor)	411	462	513	562	562	562	562	562	562	562
Transportation	18	21	23	25	25	25	25	25	25	25
Total = DLR cost	1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481

ROI(M) Calculations — AH-64 Pressurization of Hydraulic Reservoirs

Material Savings	YEAR / Time	1	2	3	4	5	6	7	8	9	10
					$/ 1000						

Denominator (Cost to undertake new program)

	1	2	3	4	5	6	7	8	9	10
Non-recurring cost	225	0	0	0	0	0	0	0	0	0
Development	225	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	6	10	20	36	36	36	36	36	36	36
Installs (H/W)	3	5	10	18	18	18	18	18	18	18
Installation (depot labor)	3	5	10	18	18	18	18	18	18	18
Total Cost to Implement	231	10	20	36	36	36	36	36	36	36
Cum Cost to Implement	231	241	261	297	333	369	405	441	477	513
Discounted Cost to Implement	231	241	259	290	320	348	375	401	426	450

Numerator (Delta support cost resulting from new program)

Cost to support existing program

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	0	0	0	361	722	1,083	1,444	1,805	2,166	2,527
DLR cost	0	0	0	361	722	1,083	1,444	1,805	2,166	2,527
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0

Cost to support new program

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	0	0	0	227	453	680	907	1,133	1,360	1,587
DLR cost	0	0	0	227	453	680	907	1,133	1,360	1,587
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0

Delta support cost (plus is good)

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	0	0	0	134	269	403	537	671	806	940
DLR cost	0	0	0	134	269	403	537	671	806	940
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Total Delta	0	0	0	134	269	403	537	671	806	940
Cumulative Delta	0	0	0	134	403	806	1,343	2,014	2,819	3,759
Discounted Cumulative Delta	0	0	0	117	339	657	1,062	1,545	2,097	2,712

Return on Investment

	1	2	3	4	5	6	7	8	9	10
ROI (Numerator/denominator)		0.0	0.0	0.5	1.2	2.2	3.3	4.6	5.9	7.3
DISCOUNTED ROI		0.0	0.0	0.4	1.1	1.9	2.8	3.8	4.9	6.0

ROI(M) Calculations

AH-64 Pressurization of Hydraulic Reservoirs

Material Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0.
Recurring cost		36	36	34	0	0	0	0	0	0	0
Installs (H/W)		18	18	17	0	0	0	0	0	0	0
Installation (depot labor)		18	18	17	0	0	0	0	0	0	0
Total Cost to Implement		36	36	34	0	0	0	0	0	0	0
Cum Cost to Implement		549	585	619	619	619	619	619	619	619	619
Discounted Cost to Implement		472	493	513	513	513	513	513	513	513	513
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		2,888	3,248	3,609	3,970	4,331	4,692	5,053	5,414	5,775	6,136
DLR cost		2,888	3,248	3,609	3,970	4,331	4,692	5,053	5,414	5,775	6,136
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
DLR cost		1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)											
Wholesale materiel cost		1,074	1,208	1,343	1,489	1,850	2,211	2,572	2,933	3,294	3,655
DLR cost		1,074	1,208	1,343	1,489	1,850	2,211	2,572	2,933	3,294	3,655
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Total Delta		1,074	1,208	1,343	1,489	1,850	2,211	2,572	2,933	3,294	3,655
Cumulative Delta		4,833	6,041	7,384	8,873	10,724	12,935	15,507	18,440	21,735	25,390
Discounted Cumulative Delta		3,383	4,102	4,865	5,672	6,629	7,719	8,929	10,246	11,656	13,149
Return on Investment											
ROI (Numerator/denominator)		8.8	10.3	11.9	14.3	17.3	20.9	25.1	29.8	35.1	41.0
DISCOUNTED ROI		7.2	8.3	9.5	11.1	12.9	15.1	17.4	20.0	22.7	25.6

ROI(T) Calculations

Time   **AH-64 Pressurization of Hydraulic Reservoirs**

Total Savings	YEAR	1	2	3	4	5	6	7	8	9	10
						$/ 1000					
Denominator (Cost to undertake new program)											
Non-recurring cost		225	0	0	0	0	0	0	0	0	0
Development		225	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		6	10	20	36	36	36	36	36	36	36
Installs (H/W)		3	5	10	18	18	18	18	18	18	18
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Installation (field labor)		0	0	0	0	0	0	0	0	0	0
Total cost to implement		231	10	20	36	36	36	36	36	36	36
Cumulative total cost to implement		231	241	261	297	333	369	405	441	477	513
Discounted cumulative total cost		231	241	259	290	320	348	375	401	426	450
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		0	0	0	361	722	1,083	1,444	1,805	2,166	2,527
DLR cost		0	0	0	361	722	1,083	1,444	1,805	2,166	2,527
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		0	0	0	227	453	680	907	1,133	1,360	1,587
DLR cost		0	0	0	227	453	680	907	1,133	1,360	1,587
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Delta support cost											
Wholesale materiel cost		0	0	0	134	269	403	537	671	806	940
DLR cost		0	0	0	134	269	403	537	671	806	940
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Total delta cost to support		0	0	0	134	269	403	537	671	806	940
Cumulative total delta cost to support		0	0	0	134	403	806	1,343	2,014	2,819	3,759
Discounted cumulative delta cost		0	0	0	117	339	657	1,062	1,545	2,097	2,712

Return on Investment

		1	2	3	4	5	6	7	8	9	10
ROI (Numerator/denominator)		0.0	0.0	0.0	0.5	1.2	2.2	3.3	4.6	5.9	7.3
Discounted ROI		0.0	0.0	0.0	0.4	1.1	1.9	2.8	3.8	4.9	6.0

ROI(T) Calculations

AH-64 Pressurization of Hydraulic Reservoirs

Total Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		36	36	34	0	0	0	0	0	0	0
Installs (H/W)		18	18	17	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Installation (field labor)		0	0	0	0	0	0	0	0	0	0
Total cost to implement		36	36	34	0	0	0	0	0	0	0
Cumulative total cost to implement		549	585	619	619	619	619	619	619	619	619
Discounted cumulative total cost		472	493	513	513	513	513	513	513	513	513
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		2,888	3,248	3,609	3,970	4,331	4,692	5,053	5,414	5,775	6,136
DLR cost		2,888	3,248	3,609	3,970	4,331	4,692	5,053	5,414	5,775	6,136
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
DLR cost		1,813	2,040	2,267	2,481	2,481	2,481	2,481	2,481	2,481	2,481
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Delta support cost											
Wholesale materiel cost		1,074	1,208	1,343	1,489	1,850	2,211	2,572	2,933	3,294	3,655
DLR cost		1,074	1,208	1,343	1,489	1,850	2,211	2,572	2,933	3,294	3,655
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Total delta cost to support		1,074	1,208	1,343	1,489	1,850	2,211	2,572	2,933	3,294	3,655
Cumulative total delta cost to support		4,833	6,041	7,384	8,873	10,724	12,935	15,507	18,440	21,735	25,390
Discounted cumulative delta cost		3,383	4,102	4,865	5,672	6,629	7,719	8,929	10,246	11,656	13,149
Return on Investment											
ROI (Numerator/denominator)		8.8	10.3	11.9	14.3	17.3	20.9	25.1	29.8	35.1	41.0
Discounted ROI		7.2	8.3	9.5	11.1	12.9	15.1	17.4	20.0	22.7	25.6

AH-64 Engine Nose Gearbox Change to Cartridge Type Oil Pump

◆   Return on investment (ROI) analysis

Project Title: **AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump**
Source: Army, ATCOM, PEO-AV

ASSUMPTIONS:

1) Objective: Improve reliability and reduce material repair cost of left and right engine to main transmission nose gearboxes
   by upgrading the pump to a cartridge type pump with intake oil filter .
2) All costs are are expressed in FY __95__ dollars
3) Dollars expressed in ___$1,000__ s throughout spreadsheet except this page
4) OMB CIR A-94 discount rate = __4.8%__ for investments 3/95-2/96 with maturity of 10-20 years
5) Modification will be done on attrition basis anytime a gearbox is returned to depot.
6) Data from McDonnel Douglas VECP Serial No. A013-48, 19 January 95

Description	Current Config. left	Current Config. right	Proposed Config. left	Proposed Config. right		
Annual Demand (gearboxes/yr.)	69	78	58	65		
Demand rate	0.087564	0.098985	0.073604	0.082487		
Repair + weighted Modification Cost			$ 7,650	$ 7,650		
Depot scrap rate	0.01	0.01	0.01	0.01		
Depot repair cost (prop. weighted)	$ 6,500	$ 6,500	$ 5,750	$ 5,750		
Depot hours per repair + MOC hrs	13	13	13	13	Depot hourly labor rate= $	185
Unit cost	$37,709	$51,940	$37,709	$51,940		
Shipping/transportation	$ 187	$ 187	$ 187	$ 187		
Fleet size (# aircraft)	788	788	788	788		
Pump replacement cost	$ 2,100	$ 2,100	$ 1,050	$ 1,050		

RESULTS:

MATERIAL ONLY

1) ROI M at 10 years	-0.3 to 1	For an investment of $	**200,000**
		Cumulative saving of $	**(63,494)**
2) ROI M at 20 years	9.5 to 1	For an investment of $	200,000
		Cumulative saving of $	1,901,761

DISCOUNTED, MATERIALS ONLY

3) ROI M d at 10 years	-0.8 to 1	For discounted investment of $	200,000
		Cumulative saving of $	(151,805)
4) ROI M d at 20 years	4.1 to 1	For discounted investment of $	200,000
		Cumulative saving of $	826,374

TOTAL SAVINGS   No field labor savings reported

5) ROI T at 10 years	-0.3 to 1	For an investment of $	200,000
		Cumulative saving of $	(63,494)
6) ROI T at 20 years	9.5 to 1	For an investment of $	200,000
		Cumulative saving of $	1,901,761

DISCOUNTED TOTAL SAVINGS

7) ROI T d at 10 years	-0.8 to 1	For discounted investment of $	200,000
		Cumulative saving of $	(151,805)
8) ROI T d at 20 years	4.1 to 1	For discounted investment of $	200,000
		Cumulative saving of $	826,374

AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to support existing										
program					$/ 1000					
Wholesale materiel cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
DLR cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
Replen buy cost										
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cum w/o Milpers)	1,390	2,780	4,170	5,560	6,950	8,340	9,730	11,120	12,510	13,900
Cum (with Milpers)	1,390	2,780	4,170	5,560	6,950	8,340	9,730	11,120	12,510	13,900

		year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
	EXISTING PROGRAM										
	Aircraft / Nose Gear Boxes #s	788	788	788	788	788	788	788	788	788	788
left	*Failures #s*	69	69	69	69	69	69	69	69	69	69
left	Scrap/Washout replacement	26	26	26	26	26	26	26	26	26	26
left	Repair/overhaul	444	444	444	444	444	444	444	444	444	444
left	**Material/repair subtotal**	470	470	470	470	470	470	470	470	470	470
left	**Repair labor cost**	164	164	164	164	164	164	164	164	164	164
left	**Transportation**	13	13	13	13	13	13	13	13	13	13
left	Left nose gearbox TOTAL	647	647	647	647	647	647	647	647	647	647
Rt.	*Failures #s*	78	78	78	78	78	78	78	78	78	78
Rt.	Scrap/Washout replacement	41	41	41	41	41	41	41	41	41	41
Rt.	Repair/overhaul	502	502	502	502	502	502	502	502	502	502
Rt.	**Material/repair subtotal**	542	542	542	542	542	542	542	542	542	542
Rt.	**Repair labor cost**	186	186	186	186	186	186	186	186	186	186
Rt.	**Transportation**	15	15	15	15	15	15	15	15	15	15
Rt.	Right nose gearbox TOTAL	743	743	743	743	743	743	743	743	743	743
	Repair costs (mtl.)	1,012	1,012	1,012	1,012	1,012	1,012	1,012	1,012	1,012	1,012
	MMH (labor)	350	350	350	350	350	350	350	350	350	350
	Transportation	27	27	27	27	27	27	27	27	27	27
	Total = DLR cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390

AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump

$/ 1000	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to support existing program										
Wholesale materiel cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
DLR cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
Replen buy cost										
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										
Cum w/o Milpers)	15,290	16,680	18,070	19,460	20,849	22,239	23,629	25,019	26,409	27,799
Cum (with Milpers)	15,290	16,680	18,070	19,460	20,849	22,239	23,629	25,019	26,409	27,799

EXISTING PROGRAM

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Aircraft / Nose Gear Boxes #s	788	788	788	788	788	788	788	788	788	788
left Failures #s	69	69	69	69	69	69	69	69	69	69
left Scrap/Washout replacement	26	26	26	26	26	26	26	26	26	26
left Repair/overhaul	444	444	444	444	444	444	444	444	444	444
left Material/repair subtotal	470	470	470	470	470	470	470	470	470	470
left Repair labor cost	164	164	164	164	164	164	164	164	164	164
left Transportation	13	13	13	13	13	13	13	13	13	13
left Left nose gearbox TOTAL	647	647	647	647	647	647	647	647	647	647
Rt. Failures #s	78	78	78	78	78	78	78	78	78	78
Rt. Scrap/Washout replacement	41	41	41	41	41	41	41	41	41	41
Rt. Repair/overhaul	502	502	502	502	502	502	502	502	502	502
Rt. Material/repair subtotal	542	542	542	542	542	542	542	542	542	542
Rt. Repair labor cost	186	186	186	186	186	186	186	186	186	186
Rt. Transportation	15	15	15	15	15	15	15	15	15	15
Rt. Right nose gearbox TOTAL	743	743	743	743	743	743	743	743	743	743
Repair costs (mtl.)	1,012	1,012	1,012	1,012	1,012	1,012	1,012	1,012	1,012	1,012
MMH (labor)	350	350	350	350	350	350	350	350	350	350
Transportation	27	27	27	27	27	27	27	27	27	27
Total = DLR cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390

AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to undertake new program										
Non-recurring cost	200	0	0	0	0	0	0	0	0	0
Development	200									
Integration										
H/W engineering										
S/W engineering										
Integration assets										
Regression T&E										
Data										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										

	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Cost to support new program (sum of phasing in & phasing out designs)										
Wholesale materiel cost	1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
DLR cost	1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
Total annual (with Milpers)	1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
Cum (without Milpers)	1,557	3,069	4,540	5,973	7,372	8,741	10,082	11,398	12,691	13,963
Cum (with MilPers)	1,557	3,069	4,540	5,973	7,372	8,741	10,082	11,398	12,691	13,963
Cost to support new design										
Wholesale materiel cost	1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
DLR cost	1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

Cost to support old (phasing out) design	{ATTRITION BASIS THUS, NO OLD SYSTEM COSTS}									
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost										
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump

$/ 1000	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10

PROPOSED PROGRAM

LEFT NOSE GEARBOX

Phase-out Old Config.

		year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
left	# Aircraft existing config.	788	719	656	599	546	498	455	415	379	345
left	# Failures/upgrade events	69	63	57	52	48	44	40	36	33	30
left	Scrap/Washout replaceme	26	24	22	20	18	16	15	14	13	11
left	Repair/modify	523	477	435	397	362	330	302	275	251	229
left	Material/mod. subtotal	549	501	457	417	380	347	317	289	264	240
left	Repair labor cost	164	150	137	125	114	104	95	87	79	72
left	Transportation	13	12	11	10	9	8	7	7	6	6
left	Subtotal: old repair/mod	726	662	604	551	503	459	419	382	349	318

Phase-in New Config.

		year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
left	# Aircraft new config.	0	69	132	189	242	290	333	373	409	443
left	# Failures new config.	0	5	10	14	18	21	25	27	30	33
left	Scrap/Washout replaceme	0	2	4	5	7	8	9	10	11	12
left	Repair material	0	29	55	79	101	121	140	156	172	185
left	Material/mod. subtotal	0	31	59	85	108	129	149	167	183	198
left	Repair labor cost	0	12	23	33	42	51	58	65	72	78
left	Transportation	0	1	2	3	3	4	5	5	6	6
left	Subtotal: old repair/mod	0	44	84	120	154	184	212	237	260	281

L. Gearbox Summary

		year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
left	**Repair costs (mtl)**	**549**	**531**	**516**	**501**	**488**	**476**	**465**	**456**	**446**	**438**
left	**MMH (labor)**	**164**	**162**	**160**	**158**	**156**	**155**	**153**	**152**	**151**	**150**
left	**Transportation**	**13**	**13**	**13**	**12**	**12**	**12**	**12**	**12**	**12**	**12**
left	**SUBTOTAL DLR**	**726**	**706**	**688**	**672**	**657**	**643**	**631**	**619**	**609**	**600**

RIGHT NOSE GEARBOX

Phase-out Old Config.

		year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Rt.	# Aircraft existing config.	788	710	640	576	519	468	422	380	342	308
Rt.	# Failures/upgrade events	78	70	63	57	51	46	42	38	34	31
Rt.	Scrap/Washout replaceme	41	37	33	30	27	24	22	20	18	16
Rt.	Repair/modify	591	532	480	432	389	351	316	285	257	231
Rt.	Material/mod. subtotal	631	569	512	462	416	375	338	304	274	247
Rt.	Repair labor cost	186	167	151	136	122	110	99	90	81	73
Rt.	Transportation	15	13	12	11	10	9	8	7	6	6
Rt.	Subtotal: old repair/mod	832	749	675	608	548	494	445	401	361	325

Phase-in New Config.

		year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Rt.	# Aircraft new config.	0	78	148	212	269	320	366	408	446	480
Rt.	# Failures new config.	0	6	12	17	22	26	30	34	37	40
Rt.	Scrap/Washout replaceme	0	3	6	9	12	14	16	17	19	21
Rt.	Repair material	0	37	70	99	126	150	172	192	209	225
Rt.	Material/mod. subtotal	0	40	76	108	138	164	188	209	228	246
Rt.	Repair labor cost	0	15	29	42	53	63	72	80	88	94
Rt.	Transportation	0	1	2	3	4	5	6	6	7	7
Rt.	Subtotal: old repair/mod	0	56	107	153	195	232	265	296	323	347

R. Gearbbox Summary

		year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Rt.	**Repair costs (mtl)**	**631**	**609**	**588**	**570**	**554**	**539**	**525**	**513**	**503**	**493**
Rt.	**MMH (labor)**	**186**	**183**	**180**	**177**	**175**	**173**	**171**	**170**	**168**	**167**
Rt.	**Transportation**	**15**	**14**	**14**	**14**	**14**	**14**	**13**	**13**	**13**	**13**
Rt.	**SUBTOTAL DLR**	**832**	**806**	**782**	**761**	**743**	**726**	**710**	**696**	**684**	**673**

		year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
	TOTAL DLR	**1,557**	**1,512**	**1,471**	**1,433**	**1,399**	**1,369**	**1,341**	**1,316**	**1,293**	**1,272**

AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump

$/ 1000	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Cost to undertake new program										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development										
Integration										
H/W engineering										
S/W engineering										
Integration assets										
Regression T&E										
Data										
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)										
Installation (depot labor)										
Installation (field labor)										

Cost to support new program (sum of phasing in & phasing out designs)

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Wholesale materiel cost	1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
DLR cost	1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total annual (without Milpers)	1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
Total annual (with Milpers)	1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
Cum (without Milpers)	15,217	16,453	17,675	18,882	20,076	21,260	22,432	23,596	24,750	25,898
Cum (with MilPers)	15,217	16,453	17,675	18,882	20,076	21,260	22,432	23,596	24,750	25,898

Cost to support new design

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Wholesale materiel cost	1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
DLR cost	1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

Cost to support old (phasing out) design {ATTRITION BASIS THUS, NO OLD SYSTEM COSTS}

	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Wholesale materiel cost	0	0	0	0	0	0	0	0	0	0
DLR cost										
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables										
Consumables										
Depot-level maint. cost										
Milpers cost										

AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump

$/ 1000	year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20

PROPOSED PROGRAM
LEFT NOSE GEARBOX

Phase-out Old Config.

		year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
left	# Aircraft existing config.	315	288	262	239	218	199	182	166	151	138
left	# Failures/upgrade events	28	25	23	21	19	17	16	15	13	12
left	Scrap/Washout replaceme	10	9	9	8	7	7	6	5	5	5
left	Repair/modify	209	191	174	159	145	132	121	110	100	92
left	Material/mod. subtotal	219	200	183	167	152	139	127	116	105	96
left	Repair labor cost	66	60	55	50	46	42	38	35	32	29
left	Transportation	5	5	4	4	4	3	3	3	2	2
left	Subtotal: old repair/mod	290	265	242	221	201	184	168	153	139	127

Phase-in New Config.

		year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
left	# Aircraft new config.	473	500	526	549	570	589	606	622	637	650
left	# Failures new config.	35	37	39	40	42	43	45	46	47	48
left	Scrap/Washout replaceme	13	14	15	15	16	16	17	17	18	18
left	Repair material	198	210	220	230	239	247	254	261	267	272
left	Material/mod. subtotal	211	224	235	245	254	263	271	278	284	290
left	Repair labor cost	83	88	92	96	100	103	106	109	112	114
left	Transportation	7	7	7	8	8	8	8	9	9	9
left	Subtotal: old repair/mod	301	318	334	349	362	374	385	395	405	413

L. Gearbox Summary

		year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
left	**Repair costs (mtl)**	431	424	417	412	407	402	397	393	390	386
left	**MMH (labor)**	149	148	147	146	145	145	144	144	143	143
left	**Transportation**	12	12	12	11	11	11	11	11	11	11
left	**SUBTOTAL DLR**	591	583	576	569	563	558	553	548	544	540

RIGHT NOSE GEARBOX

Phase-out Old Config.

		year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Rt.	# Aircraft existing config.	278	250	226	203	183	165	149	134	121	109
Rt.	# Failures/upgrade events	28	25	22	20	18	16	15	13	12	11
Rt.	Scrap/Washout replaceme	14	13	12	10	9	8	8	7	6	6
Rt.	Repair/modify	208	188	169	152	137	124	111	100	90	82
Rt.	Material/mod. subtotal	223	201	181	163	147	132	119	107	97	87
Rt.	Repair labor cost	65	59	53	48	43	39	35	32	28	26
Rt.	Transportation	5	5	4	4	3	3	3	2	2	2
Rt.	Subtotal: old repair/mod	293	264	238	214	193	174	157	141	127	115

Phase-in New Config.

		year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Rt.	# Aircraft new config.	510	538	562	585	605	623	639	654	667	679
Rt.	# Failures new config.	42	44	46	48	50	51	53	54	55	56
Rt.	Scrap/Washout replaceme	22	23	24	25	26	27	27	28	29	29
Rt.	Repair material	240	252	264	275	284	293	300	307	313	319
Rt.	Material/mod. subtotal	261	275	288	300	310	319	328	335	342	348
Rt.	Repair labor cost	100	106	110	115	119	122	126	128	131	133
Rt.	Transportation	8	8	9	9	9	10	10	10	10	10
Rt.	Subtotal: old repair/mod	369	389	407	423	438	451	463	474	483	492

R. Gearbbox Summary

		year 11	year 12	year 13	year 14	year 15	year 16	year 17	year 18	year 19	year 20
Rt.	**Repair costs (mtl)**	484	476	469	462	457	451	447	442	439	435
Rt.	**MMH (labor)**	166	165	164	163	162	161	161	160	160	159
Rt.	**Transportation**	13	13	13	13	13	13	13	13	13	12
Rt.	**SUBTOTAL DLR**	663	654	645	638	631	625	620	615	611	607

	TOTAL DLR	1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147

ROI(M) Calculations — I-64 Engine Nose gearbox change to Cartridge Type Oil Pump

Material Savings	YEAR	1	2	3	4	5	6	7	8	9	10
					$/ 1000						
Denominator (Cost to undertake new program)											
Non-recurring cost		200	0	0	0	0	0	0	0	0	0
Development		200	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Total Cost to Implement		200	0	0	0	0	0	0	0	0	0
Cum Cost to Implement		200	200	200	200	200	200	200	200	200	200
Discounted Cost to Implement		200	200	200	200	200	200	200	200	200	200
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
DLR cost		1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
DLR cost		1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)											
Wholesale materiel cost		(167)	(122)	(81)	(43)	(9)	21	49	74	97	118
DLR cost		(167)	(122)	(81)	(43)	(9)	21	49	74	97	118
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Total Delta		(167)	(122)	(81)	(43)	(9)	21	49	74	97	118
Cumulative Delta		(167)	(289)	(370)	(413)	(423)	(401)	(352)	(278)	(181)	(63)
Discounted Cumulative Delta		(167)	(284)	(357)	(395)	(402)	(386)	(349)	(295)	(229)	(152)
Return on Investment											
ROI (Numerator/denominator)			-1.4	-1.8	-2.1	-2.1	-2.0	-1.8	-1.4	-0.9	-0.3
DISCOUNTED ROI			-1.4	-1.8	-2.0	-2.0	-1.9	-1.7	-1.5	-1.1	-0.8

ROI(M) Calculations

AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump

Material Savings YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)										
Non-recurring cost	0	0	0	0	0	0	0	0	0	0
Development	0	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)	0	0	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Total Cost to Implement	0	0	0	0	0	0	0	0	0	0
Cum Cost to Implement	200	200	200	200	200	200	200	200	200	200
Discounted Cost to Implement	200	200	200	200	200	200	200	200	200	200
Numerator (Delta support cost resulting from new program)										
Cost to support existing program										
Wholesale materiel cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
DLR cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Cost to support new program										
Wholesale materiel cost	1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
DLR cost	1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	.0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Delta support cost (plus is good)										
Wholesale materiel cost	136	153	169	183	195	207	217	227	235	243
DLR cost	136	153	169	183	195	207	217	227	235	243
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Total Delta	136	153	169	183	195	207	217	227	235	243
Cumulative Delta	73	226	395	578	773	980	1,197	1,424	1,659	1,902
Discounted Cumulative Delta	(67)	25	121	220	321	423	525	626	727	826
Return on Investment										
ROI (Numerator/denominator)	0.4	1.1	2.0	2.9	3.9	4.9	6.0	7.1	8.3	9.5
DISCOUNTED ROI	-0.3	0.1	0.6	1.1	1.6	2.1	2.6	3.1	3.6	4.1

ROI(T) Calculations

Total Savings	YEAR	Time 1	2	3	4	5	6	7	8	9	10

AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump

$/ 1000

Denominator (Cost to undertake new program)

	1	2	3	4	5	6	7	8	9	10
Non-recurring cost	200	0	0	0	0	0	0	0	0	0
Development	200	0	0	0	0	0	0	0	0	0
Integration	0	0	0	0	0	0	0	0	0	0
H/W engineering	0	0	0	0	0	0	0	0	0	0
S/W engineering	0	0	0	0	0	0	0	0	0	0
Integration assets	0	0	0	0	0	0	0	0	0	0
Regression T&E	0	0	0	0	0	0	0	0	0	0
Data	0	0	0	0	0	0	0	0	0	0
Recurring cost	0	0	0	0	0	0	0	0	0	0
Installs (H/W)	0	0	0	0	0	0	0	0	0	0
Installation (depot labor)	0	0	0	0	0	0	0	0	0	0
Installation (field labor)	0	0	0	0	0	0	0	0	0	0
Total cost to implement	200	0	0	0	0	0	0	0	0	0
Cumulative total cost to implement	200	200	200	200	200	200	200	200	200	200
Discounted cumulative total cost	200	200	200	200	200	200	200	200	200	200

Numerator (Delta support cost resulting from new program)

Cost to support existing program

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
DLR cost	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0

Cost to support new program

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
DLR cost	1,557	1,512	1,471	1,433	1,399	1,369	1,341	1,316	1,293	1,272
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0

Delta support cost

	1	2	3	4	5	6	7	8	9	10
Wholesale materiel cost	(167)	(122)	(81)	(43)	(9)	21	49	74	97	118
DLR cost	(167)	(122)	(81)	(43)	(9)	21	49	74	97	118
Replen buy cost	0	0	0	0	0	0	0	0	0	0
Reparables	0	0	0	0	0	0	0	0	0	0
Consumables	0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost	0	0	0	0	0	0	0	0	0	0
Milpers cost	0	0	0	0	0	0	0	0	0	0
Total delta cost to support	(167)	(122)	(81)	(43)	(9)	21	49	74	97	118
Cumulative total delta cost to support	(167)	(289)	(370)	(413)	(423)	(401)	(352)	(278)	(181)	(63)
Discounted cumulative delta cost	(167)	(284)	(357)	(395)	(402)	(386)	(349)	(295)	(229)	(152)

Return on Investment

	1	2	3	4	5	6	7	8	9	10
ROI (Numerator/denominator)	-0.8	-1.4	-1.8	-2.1	-2.1	-2.0	-1.8	-1.4	-0.9	-0.3
Discounted ROI	-0.8	-1.4	-1.8	-2.0	-2.0	-1.9	-1.7	-1.5	-1.1	-0.8

ROI(T) Calculations

AH-64 Engine Nose gearbox change to Cartridge Type Oil Pump

Total Savings	YEAR	11	12	13	14	15	16	17	18	19	20
Denominator (Cost to undertake new program)											
Non-recurring cost		0	0	0	0	0	0	0	0	0	0
Development		0	0	0	0	0	0	0	0	0	0
Integration		0	0	0	0	0	0	0	0	0	0
H/W engineering		0	0	0	0	0	0	0	0	0	0
S/W engineering		0	0	0	0	0	0	0	0	0	0
Integration assets		0	0	0	0	0	0	0	0	0	0
Regression T&E		0	0	0	0	0	0	0	0	0	0
Data		0	0	0	0	0	0	0	0	0	0
Recurring cost		0	0	0	0	0	0	0	0	0	0
Installs (H/W)		0	0	0	0	0	0	0	0	0	0
Installation (depot labor)		0	0	0	0	0	0	0	0	0	0
Installation (field labor)		0	0	0	0	0	0	0	0	0	0
Total cost to implement		0	0	0	0	0	0	0	0	0	0
Cumulative total cost to implement		200	200	200	200	200	200	200	200	200	200
Discounted cumulative total cost		200	200	200	200	200	200	200	200	200	200
Numerator (Delta support cost resulting from new program)											
Cost to support existing program											
Wholesale materiel cost		1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
DLR cost		1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Cost to support new program											
Wholesale materiel cost		1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
DLR cost		1,254	1,237	1,221	1,207	1,195	1,183	1,173	1,163	1,155	1,147
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Delta support cost											
Wholesale materiel cost		136	153	169	183	195	207	217	227	235	243
DLR cost		136	153	169	183	195	207	217	227	235	243
Replen buy cost		0	0	0	0	0	0	0	0	0	0
Reparables		0	0	0	0	0	0	0	0	0	0
Consumables		0	0	0	0	0	0	0	0	0	0
Depot-level maint. cost		0	0	0	0	0	0	0	0	0	0
Milpers cost		0	0	0	0	0	0	0	0	0	0
Total delta cost to support		136	153	169	183	195	207	217	227	235	243
Cumulative total delta cost to support		73	226	395	578	773	980	1,197	1,424	1,659	1,902
Discounted cumulative delta cost		(67)	25	121	220	321	423	525	626	727	826
Return on Investment											
ROI (Numerator/denominator)		0.4	1.1	2.0	2.9	3.9	4.9	6.0	7.1	8.3	9.5
Discounted ROI		-0.3	0.1	0.6	1.1	1.6	2.1	2.6	3.1	3.6	4.1

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13. ABSTRACT *(Maximum 200 words)*

The Deputy Under Secretary of Defense (Logistics) tasked the Logistics Management Institute (LMI) to assess the leverage available to reduce operations and support (O&S) costs through insertion of technology in fielded weapon systems. LMI evaluated the tools DoD is currently using to identify cost drivers and characterized the ongoing programs targeted at reducing O&S costs. This provided a basis for identifying the best practices in DoD and for developing recommendations for a new program.

The initial phase, documented in the Volume 1 annotated briefing, concluded that cost-tracking systems and sustaining engineering are not the limiting factors in reducing O&S costs. Rather, production funding for technology insertion is the most serious obstacle. A cost of ownership reduction investment program funded by the Defense Business Operations Fund capitalization is proposed.

Volume 2 contains a business case to test whether currently available investment candidates could provide an adequate return on investments (ROI) to justify such a program. LMI developed a Microsoft EXCEL spreadsheet model and used it to evaluate nine potential Service projects. The business case confirmed that an ROI of 9:1 in 20 years for currently available Service candidates was feasible.

14. SUBJECT TERMS

Cost of ownership reduction, O&S cost reduction, technology insertion, fielded weapon systems, ROI model, cost of ownership model, DBOF, ROI cost reduction

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